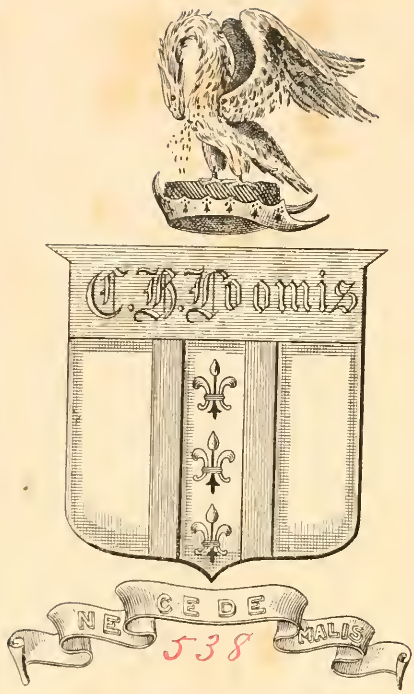
SCIENCE GOSSIP.


C. H. Loomis
NE CEDE MALIS
538

HARDWICKE'S

SCIENCE-GOSSIP:

1890.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

DR. J. E. TAYLOR, F.L.S., F.G.S., F.R.G.S.I.,

HON. MEMBER OF THE MANCHESTER LITERARY CLUB, OF THE NORWICH GEOLOGICAL SOCIETY, OF THE MARYPORT SCIENTIFIC SOCIETY, OF THE ROTHERHAM LITERARY AND SCIENTIFIC SOCIETY OF THE NORWICH SCIENCE-GOSSIP CLUB, OF THE GEOLOGICAL SOCIETY OF AUSTRALASIA, OF THE VICTORIAN FIELD NATURALISTS' CLUB, ETC. ETC.

VOLUME XXVI.

London:

CHATTO AND WINDUS, PICCADILLY.

1890.

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

PREFACE.

ANOTHER year has come and gone, and once more we find ourselves brought face to face with our readers in the publication of the twenty-sixth volume of SCIENCE-GOSSIP.

We trust and believe it has in no way lost the ground it has occupied so long, notwithstanding the hosts of competitors which have bidden with it for public favour. The Editor believes that the present volume will be found as full of original articles and observations as any of its predecessors.

If the position of a magazine is to be judged of by the articles sent for publication, SCIENCE-GOSSIP is unusually fortunate. More than half as many Papers again are sent than the narrow space of our monthly issue will allow for. It is often with sincere regret the Editor looks over valuable articles which he is obliged to lay by. On this account, he asks the forbearance of patient contributors, and desires future friends to be as brief in their communications as they conveniently can. The Editor further suggests the increased use of original illustrations to such Papers, as likely to increase their scientific value.

We were pleased with the response made of our readers last year to increase the circulation, and thereby the usefulness of our

Magazine, by obtaining new subscribers; and again beg all of them to obtain fresh recruits.

With sincerest thanks for help, sympathy, and advice, received from every part of the globe, and from all sorts and conditions of men and women, the Editor wishes all his readers and contributors

A Happy new Year.

LIST OF ILLUSTRATIONS.

THE NEBULAR HYPOTHESIS.

By E. P. Ridley.

THE hypothesis of the original nebular condition of the solar system, with the consequent explanation of planetary formations and movements of rings and satellites, was first published by Kant in 1755 in his "General History and Theory of the Heavens." It was subsequently independently propounded by Laplace in his *Système du Monde*, published about 1797—in which work it appeared as a note, and was given, as the author stated, "with the diffidence which one ought always to feel in connection with a subject which is not the result either of observation or of calculation." In the present day the hypothesis is more usually ascribed to Laplace than to Kant.

The nebular hypothesis may be briefly stated as follows. The solar system ages ago consisted of an irregular mass of nebula intensely hot and in a state of extreme gaseous tenuity, extending from its centre outwards far beyond the limits of the outermost planet, Neptune. It is practically impossible to imagine such a mass at rest; and, granted that it had some motion (however indefinite), the movement must finally end in a definite rotation in one direction round the centre of gravity, and, no matter what its primitive shape, it must at last inevitably assume the form peculiar to rotating bodies, in which the particles move freely upon each other, and become an oblate spheroid, flattened at the poles and bulging at the equator. The mass would, by pouring out heat into space and by the action of gravity, contract, and, as it contracted, it must rotate faster and faster, the velocity increasing as the space traversed diminished. Contraction generates heat, which, pouring outwards into space, would act as a centrifugal force tending to drive part of the mass outwards, while gravity would act as a centrifugal force drawing the mass in towards the centre. As the solar nebula continued to radiate heat and contract, it rotated with ever-increasing velocity, its poles becoming more and more flattened, and its equatorial zone protruding more and more, until at last the centrifugal tendency at the equator became greater than the force of gravity. Then the bulging equatorial zone, no longer able to keep pace with the rest of the mass in its contraction, was left behind as a detached ring, girdling, at a small but steadily-increasing distance, the retreating mass. This ring, unless subjected to absolutely symmetrical forces in all directions—evidently an infinitely improbable supposition—would, still contracting, break, much as a dish breaks when dropped on to the floor, into a host of fragments of very unequal dimensions. Instead of a continuous ring, we should now have a host of satellites surrounding the solar equator, revolving in the direction of the solar rotation, and following each other in the same orbit. Each large fragment would by its gravitative force retard the smaller fragment in front of it, and accelerate the smaller fragment behind it. This process would continue until all the fragments were finally united with a spheroidal body having a velocity compounded of the several velocities of the fragments and a rotation made up of their several rotations.

The central mass continued to radiate heat and to contract, until a second equatorial belt was left behind to form in due time a second planet as before. In like manner, the other planets were formed one after the other, the planets themselves, by a similar process, forming their satellites.

Having now a general idea of the hypothesis, we shall proceed to consider what relation the various phenomena existing in and exhibited by the solar system bear to it.

Not only the sun, but every member of our planetary system is constantly radiating heat into surrounding space. It is not necessary to more than mention the well-established fact that both the earth and moon were formerly incandescent. The flattening of the poles absolutely demand at least a fluid body for their formation, and the observed facts of geology uniformly corroborate the former incandescent state of the earth. The sun is pouring away heat at such a rate that, according to Sir John Herschel, if a cylinder of ice 184,000 miles in length and 45 miles in diameter were darted into it every second, the ice would be melted as fast as it came; and although this enormous loss is partly compensated by heat due to the arrested motion of meteors falling upon the sun's surface, it is by no means probable that the sun is in this way compensated to any noteworthy extent. The dissipation of motion in the form of heat is always and necessarily accompanied by the concentration of matter. All cooling bodies diminish in size and increase in density. All contracting bodies generate heat by the friction of their particles upon each other. The loss of this heat by radiation allows the process of contraction to continue; so that the further back we go, the larger and less solid must have been the sun and the planets, until, if in a state of diffused vaporous matter, we may well understand that the present solar system might have once been a nebular mass extending far beyond the orbit of the outermost planet. So that, observing what is now going on, shows clearly that the solar system might formerly have consisted of a nebulous mass.

It is established that there are hovering cloud-like in space vast masses of self-luminous vapour or nebulæ; and not only nebulæ, but nebulæ in all states of development. The spectroscope has established the fact that certain nebulæ are gaseous. In 1864 Mr. Huggins found that the nebula in Draco gave a spectrum of bright lines, due to nitrogen, hydrogen, and one other unknown element, which proved the gaseous or irresolvable condition of the nebula. The spectrum of other nebulæ show, beneath the bright line spectrum of a gaseous nebula, a faint continuous spectrum, proving a more condensed state, and so on, gradually approaching the condition of our sun. Lieutenant Herschel observed in the southern Heavens a clustering nebula with a continuous spectrum, showing the presence of various metals, on which he could just detect the three bright lines seen in the spectra of the gaseous nebulæ. Cooler suns show that free hydrogen is missing; and, in short, there are exhibited various stages of condensation from the gaseous nebulæ to suns such as our own showing that the various orders of nebulæ are orders of but a single family, and that there is one and only one order of matter throughout the universe, though in various stages of development. Further, Le Sueur of Melbourne proved before 1870 that the irregular nebulæ are variable; and finally, in the magnificent photograph obtained by Mr. Roberts of the nebula in Andromeda, we have actually seen a nebula broken up into rings, with one ring partly condensed into a planet, and with other planets formed outside, where the rings have entirely disappeared. It may now be fairly stated that the series from nebulæ to planets is fully established. Sir William Herschel was struck by the circumstance that, after sweeping over a part of the heavens which was unusually barren of stars, he commonly met with nebulæ, insomuch that it was his practice at such times to call to his assistant (his sister, Miss Caroline Herschel) "to prepare for nebulæ." Mr. Proctor adds that, "in fact, the nebulæ, in a sense, represent the missing stars, and that the region where those nebulæ appear has been drained of star-material, so to speak, in order to form them."

We have established, then, the existence of irregular nebulæ which are variable—that is, the various parts of which are in motion. To proceed a step further, we know that the solar system has been pouring out heat at such an enormous rate that in the past it must have been so much hotter than at present that we may fairly assume its prior condition as a gaseous or nebulous mass. The heat must have been too great to allow of it being a solid or even a liquid body. Now, with the parts of the nebula in motion, whether the motion is in the form of currents determined hither and thither according to local circumstances, or in any other conceivable way, such motions bearing some reference to a common centre of gravity, unless the currents exactly balanced each other—a supposition against which the chances are as infinity to one—one set must eventually prevail over the other, and the mass must at last inevitably assume the form peculiar to rotating bodies, in which the particles move freely upon each other. It must become an oblate spheroid flattered at the poles and bulging at the equator, rotating faster and faster as it contracted. In some such manner as this our solar system acquired its definite rotation from west to east. A very curious physical experiment devised by M. Plateau strikingly illustrates the growth of our planetary system from the solar nebula. M. Plateau's experiment consists in freeing a fluid mass from the action of terrestrial gravity, so that its various parts may be subject only to their own mutual attractions, and then in imparting to this mass an increasingly rapid movement of rotation. A quantity of oil is poured into a glass vessel containing a mixture of water and alcohol, of which the lower strata are heavier than the oil, while the upper strata are lighter. The oil when poured in descends until it reaches the stratum of the same density with itself, when, being freed from the action of terrestrial gravity and subjected only to the mutual attraction of its own molecules, it assumes a spherical form. By an ingenious mechanical contrivance, M. Plateau causes the sphere of oil to rotate about its own centre of gravity. While the movement is slow, the excess of centrifugal force at the equator of the oil-globe causes a bulging of the equator and corresponding flattening of the poles, like that observed not only in the sun, but in all the planets. Instead of a sphere, the oil-globe becomes a spheroid of rotation. If now the movement is considerably accelerated, the equatorial portion of the oil-globe becomes detached, and surrounds the central sphere of oil in the shape of a nearly circular ring, like Saturn's ring-system. Finally, if the movement is kept up for a sufficient length of time, the oil-ring breaks into fragments, which revolve like satellites about the oil-globe, and each of the satellites keeps up for a time its own movement of rotation in the same direction as the revolution of the ring.

Now all the planets and all the satellites, so far as observation extends, are flattened at their poles. All revolve round the sun, from west to east, in the same direction as the sun rotates on its own axis. All the planets except Uranus, and probably Neptune, rotate on their own axis from west to east in the same direction as the sun. Of the exceptions more hereafter. So far as the rotation of satellites have been observed, they follow the same direction as their primaries. The orbital planes of all the planets are nearly concentric, and nearly in a plane with the ecliptic solar equator. Mercury has an inclination of about seven degrees, which is the maximum exception. But, on the other hand, the asteroids are much more inclined, one of them—Pallas—rises above the ecliptic or the plane of the solar equator as much as thirty-four degrees, and the nebular hypothesis at present has not furnished any explanations of this remarkable exception. It may be stated generally that the orbital planes of satellites are in or very near to the equatorial plane of their primaries. The combined weight of these coincidences, clearly explained by M. Plateau's experiment, forms a most powerful, though not by any means the sole, argument in favour of the nebular hypothesis.

(*To be continued.*)

NATURAL HISTORY NOTES FROM NEW ZEALAND.

SIR, may I offer you for a corner of SCIENCE-GOSSIP the following notes from letters of my brother, Robert Norgate Hawes, of Kohimarama, Auckland, New Zealand?—I am, Sir, yours truly,

S. P. HAWES.

30th January, 1887.—Mr. Dickie and I have taken some young goldfinches, and I have taken some young starlings to send down to Owen to turn out at Waverley, as there are none thereabout. Here they are very plentiful, but I find it rather difficult to get young ones, so next spring I must put up a few small boxes on the gables of the house for them to build in. I saw quite a colony of them building among the rocks and stones in the side of a scoria pit near the mount of which I have spoken, but I could not get at them except by being lowered down with a rope, and I did not care to risk that, as many of the overhanging rocks looked as if they would fall at a touch.

I hardly see a native bird here now, except a few in the bush, or an occasional hawk or seagull, but the imported ones are visible in all directions.

27th January, 1889.—I have a lot of bees, twenty-one large hives, most of which I must take next month, and as several of them have over a hundred-weight each of honey in them, that means some work.

Bess brought in the first ripe tomatoes yesterday, one half eaten by the blackbirds, so I must put up my little windmill and bell again.

The mason bees or wasps here are a great nuisance, coming into the house and stable, or any building, in fact, and filling up any hole or crevice they can find with clay and spiders; first a little wall or division of fine clay, then an egg, and next a mass of eight or ten spiders, not house spiders, but green and yellow ones from the grass and trees, some of which I never see except in these nests, one especially having a little bright round spot (o, so large) on its back, as bright as polished nickel plate. None of these spiders are dead, but they are torpid, and so keep till wanted for use by the larvæ of the wasp. In each nest there are six, or perhaps eight or ten cells, one after another. If we leave a coat or waterproof, or any article of dress hanging up for a few days, they are sure to build in the folds of it. Just now I hear one or two about the top of the curtains.

The following is from my other brother:—

Waverley, Wanganui, N.Z. 1st April, 1889.—It has just struck me that in one of your letters, you sent a clipping about cuckoos, in which a would-be wise man ridiculed the idea of a young cuckoo turning other young birds out of the nest. All I can say is, that I have seen it done over and over again, when I had put cuckoo's eggs into small birds' nests in the garden at Hayes (Slinfold). In one case, in a hedge-sparrow's nest by the bee-house, I replaced a young hedge-sparrow so persistently that the cuckoo left it alone after the third day or so. This wiseacre calls it an exploded superstition. The chances are he never saw a young cuckoo in its nest in his life.

OWEN HAWES.

(I think I saw the young cuckoo in the hedge-sparrow's nest in the bee-garden.)

S. P. H.

RANUNCULUS LINGUA.—Hooker describes this variety as having lanceolate, sessile leaves, and large flowers. Has any one noticed a variety which I have collected in this neighbourhood, having many of the characters of *R. ophioglossifolius*, viz. the lower leaves long stalked, ovate, upper ones with shorter petioles, lanceolate, and the flowers rather smaller than *R. acris?*—*W. Biddiscombe, Plumstead.*

THE VARIATION AND ABNORMAL DEVELOPMENT OF THE MOLLUSCA.

By T. D. A. Cockerell.

Part V.

When, in 1885, I commenced a series of papers in the columns of Science-Gossip under the above heading, it was my intention to consider in due sequence the phases of variation exhibited by the land and fresh-water mollusca of south-eastern England, with occasional references to those of other countries when necessary for the elucidation of the matter on hand. These papers were discontinued when I left England, but, with the Editor's permission, I will now proceed to treat of the remaining species.

Fig. 1.—*Helix hortensis*, var. *minor.* Bickley, Kent.

Fig. 2.—*Helix bourcieri.* Quito.

Fig. 3.—*Helix moricandi.* Philippines.

g. 4.—*Helix carpenteriana.* Florida. (Enlarged.)

Fig. 5.—*Helix erronea.* South India.

Fig. 6.—*Helix conoidea.* Mogador.

Fig. 7.—*Clausilia rugosa*, var. *gracilior.* Battle, Sussex.

Fig. 8.—Mouth of *C. biplicata*, "monst. *tridentatum.*" Near Hammersmith.

Fig. 9.—*Pisidium amnicum*, from Crayford fossil-pit. Showing constriction of valve, which is common in the Crayford Pisidia and Sphæria.

Part IV. treated of that polymorphic species, *Helix nemoralis;* and before leaving this subject, it may be well to record a few hitherto unpublished band-varieties of this and *H. hortensis* that have come under my notice.

H. nemoralis: var. *rubella* $0_{2}34_{5}$, Pontefract (G. Roberts); var. *libellula* $00_{3}45$, Weston-super-Mare (Hele, in coll. Ponsonby); var. *libellula* $00_{3}(45)$, Derbyshire (Milnes); var. *rubella* ${}_{12}3_{45}$, near Chislehurst (S. C. Cockerell); var. *rubella* $000_{4}5$, Truro (J. H. James); var. *rubella* $12_{3}45$, Truro (James); var. *libellula* $00({}_{34}5)$, Truro (James); var. *libellula* $000_{4}5$, near Bardowie Loch, near Glasgow (Alex. Shaw); var. *rubella* 000(44)0, band 4 appearing as a double band which joins near the aperture, Martlock, Somerset (Rev. H. Friend); var. *libellula* $0_{23}(45)$, Brackley, N. Hants (Rev. H. Friend); var. *rubella* $00_{344}0$, Pontefract (G. Roberts); var. *libellula* $003_{4}5$, Valentia, Ireland (Rev. A. H. Delap); vars. *rubella* (: : : : :), *rubella* 1 (: : : :), and *rubella* (: :) : : :, Dublin (J. R. Redding). With regard to these last three I have always taken the colon, as used in band-formula by French authors, to indicate a band interrupted at intervals, and it is so used here. The first variety (: : : : :) has five coalesced interrupted bands, the result being transverse markings, which are undulating or zigzag. This is extremely interesting as pointing to the way in which such markings were developed in species which now normally possess them. I believe this particular variety of *H. nemoralis* is var. *undulata*, Gentiluomo (1868), and Mr. Wilcock once sent me a drawing of it marked var. *transversa*, Wilcock MS.

The list of pale-lipped forms might be added to considerably, if the various combinations of banding and colour were taken into account.

The vars. *roseozonata-albolabiata* and *citrinozonata-albolabiata* have both been sent me from Yorkshire by Mr. G. Roberts. The description of the latter should, of course, read "bands pale yellow," not brown, as given in Part IV. Var. *roseozonata-roseolabiata* has been sent from Truro by Mr. James. I am by no means clear, however, that priority does not demand the substitution of *hybrida*, Poiret, and *hybrida*, Jeffreys, for the varietal names *roseolabiata* of *H. nemoralis* and *H. hortensis* respectively. The thin var. *tenuis*, Ckll. MS., Marquand, is from Truro and Falmouth, and probably is caused by want of lime. Professor F. Jeffrey Bell (Comp. Anat. and Phys. 1885, p. 305), states that no shelled forms occur at the

Lizard, and attributes this to want of lime. But in this he is not strictly accurate, as *Limnæa truncatula* has been recorded from the Lizard, and *Helix revelata* is found there. The last, however, is a thin-shelled form, and its existence is quite in harmony with Professor Bell's theory.

Helix hortensis: var. *lutea* 000($_{45}$), Torquay (L. M. Cockerell); var. *lutea* 0234$_3$, Truro (J. H. James). The band-varieties of this species are not nearly so numerous as those of *H. nemoralis*. Var. *debreauxia*, Locard, occurs at Ospringe, Kent (Fairbrass); var. *michaudia*, Locard, is also found at Ospringe.

Helix arbustorum.—There is some confusion about the varieties *pallida* and *cincta* of this species. The original name for the pale one-banded form was *pallida*, but this was withdrawn and *cincta* substituted on the grounds that Westerlund had previously named a different var. *pallida*. But it appears now that Westerlund's so-called "pallida" was part of a short Latin description of an unnamed variety, so that *cincta* is not needed for our form, and falls as a synonym.

Helix cantianaformis, Ancey.—Mr. Ancey still considers this species, described from Kent, a valid one, and I believe M. Bourguignat is of the same opinion. But it can hardly be more than a variety of some known species, at the best, although I cannot at present say where it ought to be placed. Do any of the Kentish conchologists know anything about it?

Helix cartusiana.—This species is abundant about Sandwich, but seems to have its northern limit on the south bank of the river Stour; it is interesting to see how even a small river may thus prevent the spread of a species. *H. cartusiana* was known from Sandwich, at least, as far back as 1860, when it was recorded from there by S. P. Woodward ("Recreative Science," p. 39).

Helix (*Cochlicella*) *acuta.*—British authors, following Jeffreys and others, continue to place this snail in *Bulimus*, although it is most clearly a *Helix*. I should think a little study of the continental forms allied to *Helix virgata* would convince the most sceptical of this. *Helix conoidea*, Drap., figured in SCIENCE-GOSSIP, 1887, p. 177, Fig. 94, is one of the multitude of forms intermediate between *H. acuta* and the *virgata* type of shell.

I have not sufficient material at hand to treat of the variation of *H. virgata*, *H. pisana*, and *H. caperata*. These three species are much in need of attention, and their variation and exact relationship with the multitude of continental described species offers a wide field for work.

Clausilia rolphii, var. *pellucida*, Taylor, can hardly keep a place on our lists, as apparently no one knows exactly what it is. It may be var. *albina*, Schm.

Dr. V. Sterki (Proc. U.S. Nat. Museum, 1888) has remarked on the extreme constancy in the position of the lamellæ or teeth in the apertures of the shells of the genus *Vertigo*. This observation may be made to include perhaps all the Helicidæ, the correspondence in the position of the teeth being perhaps at least as marked as that in the position of the bands. In Part IV., p. 177, are figures illustrating this. It will be seen that *H. carpenteriana*, Bld., from Florida, has exactly the same kind of lamella as *H. erronea*, from India; while two of the teeth of the South American *H. bourcieri* correspond with the only two of the Philippine *H. moricandi*.

On the same page (Fig. 97) is a figure of *Clausilia biplicata* monst. *tridentatum*; this was taken near Hammersmith, but on the Surrey side of the river. The teeth in the figure are exaggerated greatly beyond their natural size unfortunately. Fig. 98, following that of the *Clausilia*, shows very well the constriction of the valve which is so frequently seen in the fossil examples of *Pisidium* and *Sphærium* from Crayford. Why a character apparently monstral should occur so commonly among these shells, is more than I can tell. May it have been due to the effect of some parasite in retarding shell-formation at that particular point?

The varieties of *Unio pictorum* found about London deserve study. Some of them may be found to correspond with Drouët's *Unio subtilis*.

Physa hypnorum, var. *intermedia*, I have recorded from Cumberland (Smith), in the "Naturalist" for October. I omitted to state that I have also seen *Physa fontinalis*, var. *rufula*, Locard, from the same county, the exact locality being in both cases unknown to me. Both these varieties are new for Britain, and two others may also be added to the British list, namely *Succinea pfeifferi*, var. *pallida*, Moq., Leckwith, near Cardiff (Wotton), and *Limnæa peregra*, var. *globulosa*, Locard, from Enfield, Middlesex (Fryer). I have seen examples of *Vertigo pygmæa*, var. *rubella*, Locard, which I believe were collected in Yorkshire, but this is somewhat doubtful.

Limnæa peregra, var. *boissii*, Dup., I have seen from Tarleton; and var. *solemia*, Zgt., from Southport. I believe these have already been recorded.

Colorado.

NATURAL HISTORY JOTTINGS.

On the Leaf-Stalk Glands of the Common Guelder-Rose and Wild Cherry: and the Relations of Insects thereto.

SIR JOHN LUBBOCK, in a paper "On the Leaves of Guelder-Roses," read before the British Association in the Biology Section on Friday, September 13th, at Newcastle-on-Tyne, as reported in the "Newcastle Daily Chronicle" of the day following, gives some interesting and instructive information with respect to the form and vernation of the leaf of the common Guelder-rose (*Viburnum Opulus*); but no mention is made of his having made any reference to the numerous nectar-secreting, insect-attracting glands with which the leaf-stalk is provided, and which are, perhaps, fully as interesting to the student of Nature and as important in the economy of the plant.

I had been looking forward to this paper, scarce doubting to see some reference to these singular, and, so far as I am aware, almost, though not quite, unique plant-organs in the British flora; inasmuch as they affect the habits and economy of one of Sir John's favourite insects—the ant, and touch upon a favourite and highly-interesting theme—the relations of insects to plants; and I must confess to being somewhat disappointed at no reference being made to the relations of the ant, as well as of a number of other species of insects, to the common Guelder-rose.

It is a few years ago since I first observed and closely attended to the habit of two species of our ants freely and continuously haunting various species of aphis-infested plants, for the purpose of milking the Aphides,* i.e., obtaining the liquid anal excretions of these insects—the so-called "honey-dew," whose production most writers on Natural History whose works I have read, assign to the two dorsal cornua situate near the apex of the abdomen, but which I have fully satisfied myself by repeated and careful observations extending over a series of years, is produced, so far as the Aphides are concerned, by their anal emissions of liquid excreta, and not by any emitted secretion or excretion from the cornua; and in the early summer of 1887 I first became aware, by actual observation, of the habit of these same two species of ants as freely and continuously affecting the bush vetch (*Vicia sepium*) to obtain the transparent sweet liquor—the nectar—so plentifully secreted in the cavity on the under side of the stipulas of the leaves of this common hedge-side plant, though on seeing it I at once remembered that I had read of the circumstance in one of Grant Allen's interesting and instructive Natural History books; but it was only about mid-June of last year (1888) that I became aware of the fact of the same common black ant (a species of Formica), as well as of other species of insects, haunting the foliage of the Guelder-rose for the purpose of revelling on the abundant transparent sweet liquor secreted within the hollow or trough at the summit of the numerous elevated reniform green glands with which the leaf-stalk at the base of the blade is furnished, and which, running along each side of the channel in the upper side of the stalk, not infrequently extend a little distance up the blade of the leaf at one or both sides, and sometimes, when very numerous, extending to the base of the stalk and even on to the stipulas. These glands are not invariably reniform, but may be rounded, elliptical, or oblong.

* SCIENCE-GOSSIP, July, 1883, p. 150.

On referring to my Natural History diary for 1888, I find, under date June 11th, the following first note bearing on the subject: At about 5 P.M. this evening, as I was walking along a lane at Killingworth, I discovered a low and somewhat spreading bush of the common Guelder-rose (*Viburnum Opulus*) in the hedge-side; and on looking down upon its fresh and pleasing foliage, found that it was swarming with the common black, or rather, bronze-black, ant and a species of ant-fly much resembling the ant, both in the form of its thorax and abdomen and in its dark and bronzed coloration. And what think you that they, as well as many other small flies of at least two species, were after? Something that vividly recalled to my mind Belt's "Naturalist in Nicaragua" account of the acacia-inhabiting-and-protecting ant of Central America! They were visiting and sipping the nectar from the kidney-shaped glands that exist on the leaf-stalk at the base of the leaf of this small tree or shrub! Not infrequently two of the ants were engaged at the same moment on the glands of one leaf. The ant-flies ran about over the foliage and up to the glands to sip the nectar, with the wings, as is the habit of this tribe of Diptera, partly raised and kept in perpetual motion, and the abdomen raised and lowered a little incessantly—kept palpitating, and, whenever an ant approached, the fly took one of its short flying leaps to a respectful distance from the—guardians (?) of the plant.

All through the summer and autumn of 1888, up to the middle of September, I found the ant and ant-fly invariably present on the foliage and at the nectar-secreting glands; also, on different occasions, I observed other small flies, beetles, and moths, all sipping the copiously secreted transparent sweet liquor.

This year (1889), so early as May 21st, before the foliage was fully evolved, the ants were already up at these leaf-stalk glands; and all through the year, up to October 4th, both the ants and ant-flies (which appeared one week later) have been present, visiting the glands, and lapping or sipping the nectar therefrom. Frequently, too, have I seen flies of several different species, including the flesh-fly, dung-fly, and flies of the size and type of the house-fly, and Ichneumons of at least two species, obtaining the nectar; as well as on other occasions a medium-sized saw-fly, a cynips, a spice-wife beetle (*Telephorus*), a skipjack or click-beetle (*Athöus hæmorrhoidalis*), and also one of the larger snipe-flies, the *Empis tesselata*. Notwithstanding the long snipe-like tongue or proboscis of the highly predatory Empis, which appears about as suitable for lapping up the nectar from these leaf-stalk glands of the Guelder-rose and the shallow nectaries of many flowers, as the bill of the crane in the fable, yet both it and many of its smaller congeners are frequent visitors to flowers for the sake of the nectar; and when obtaining the sweet secretion from shallow open nectaries, the extremity of the very long proboscis may be observed to open and spread out to some extent, thus enabling an apparently ill-adapted organ to secure a coveted pabulum.

Whilst sipping the nectar from the leaf-stalk glands of the Guelder-rose, as well as from the stipula-cups of the bush vetch, the ants keep playing their antennæ tremulously over the gland, and the cup, and parts adjacent, in much the same fashion as I have observed them do over the bodies of the aphides when attendant on and milking these insects. In these nectar-secreting, insect-attracting leaf-organs of the former plant, which to my mind appear to be simply modified portions of suppressed, or undeveloped lamina or blade of the leaf, the transparent sweet liquor is secreted by the walls of the entire trough in globules, at first minute but gradually increasing in size, and ultimately running together into one drop, which may fill to the lip this form of plant-nectary; whilst in very many flowers the nectar is similarly secreted in globules by the entire nectariferous zone or concavity or cup, as the case may be, ultimately running together, less or more.

I have said above that leaf-stalk glands are not wholly peculiar to the *Viburnum Opulus* (common Guelder-rose). They are present, though in less numbers, on the stalk of the leaf of the *Prunus cerasus* (wild cherry), at the base of the blade, and not infrequently situated on the blade itself on one or both sides at its base. Here the glands are mostly two in number, often one, sometimes three, and not infrequently are entirely absent; and are generally reniform, though sometimes roundish or ovalish. They are fleshy and elevated, as in the Guelder-rose, and freely secrete in globules over their entire summit a transparent thin liquor which ultimately runs together into a sheet or drop; but they have no regular depression or trough, as have those of the Guelder-rose, being simply irregularly and shallowly depressed at the summit—they are less perfectly evolved. Though I have not satisfied myself that these leaf-glands of the wild cherry are insect-attracting, still I suspect they are so, and have reason to expect they will be; for it appears to be a pretty general law throughout Nature that where food is there will eaters be.

Smith ("Compendium of the English Flora") says that there are "two glands on the under side at the base" of the leaf of the *Prunus padus* (bird cherry); and Hooker ("Flora Scotica"), that there are "two glands at the summit of the footstalk" of the leaf of this same species of tree.

CHARLES ROBSON.

WE much regret having to chronicle the death of a distinguished botanist and old correspondent of SCIENCE-GOSSIP, Professor McNab, the Scientific Director of the Gardens at Glasnevin, Dublin.

BIRD-EGG CURIOSITIES.

IT is a well-known fact that the eggs of many species of birds, such as rooks, guillemots, gulls, thrushes and lapwings, exhibit great want of uniformity in shape, size and colouring; and it sometimes happens that this departure from the normal conditions, especially in background coloration and marking, is so great that a novice might well be excused for supposing that two eggs taken from the same nest belonged to entirely different species of birds. Any one who has been, either in youth or manhood, a collector of bird-eggs cannot fail to have noticed this variation; yet it is more than probable that the bulk of collectors have left their observations unchronicled, and it is in the hope that further interest may be excited in the subject that we have endeavoured to group and arrange the various cases which have come under our own notice.

It may be taken as a general rule that the eggs of most birds vary more or less in the above named particulars; in fact, it is probable that no species is entirely exempt from the liability to these accidents, or defects. Those birds, perhaps, are the most exempt which lay white eggs; but that even these sometimes depart from the normal state there is ample evidence to show. We have, for example, in our collection, a hen's egg of the usual size and shape, but which is speckled all over in exact imitation of the turkey's; while brown, of various shades, is of tolerably frequent occurrence in the eggs of the same species. As mentioned above, guillemots' eggs are well known instances of colour variation, specimens varying in background from greyish-white to grass-green. The eggs of the red grouse, the rook, and the plover also vary to a great extent, both in colour and marking. Some of the latter have been procured with a very pale self-coloured background, an abnormity possibly due to abortion, which seems to be one of the mysterious causes of the absence of the usual pigment in egg-shells. A great number of similar instances might be cited did space permit.

It sometimes happens, though less frequently, that various birds whose eggs are usually bright and artistically coloured, will lay pure white ones. We well remember being much puzzled by three white, curiously shaped eggs, which lay snugly in a nest to all appearances that of a yellow-hammer. Having set ourselves to watch, we found that they were indeed the production of that bird; and subsequently we discovered two or three other nests of the same species, each containing white eggs only.

We have also taken, three times in succession, from the same gable end of a farm-building (though never from the same nest), house-sparrows' eggs which were quite destitute of colouring. Unfortunately, we were never able to determine with certainty whether or not the same bird deposited the eggs. In all probability these white varieties, as well as the abnormally pale ones, are due to abortion; though maternal anxiety, weakness, fright and other causes must also be taken into consideration in accounting for these aberrations. It is recorded by a Bacup observer that many of the blackbird's eggs taken from the heather bushes high up on the moorlands in that vicinity, are of a blackish hue, so it is quite possible that some of the variations in colour are due to food-variety and climatic influences. When, however, only one aberrant egg is found in a nest with several others of the normal hue, it is more difficult to account for the irregularity. As a case in point, we instance a landrail's egg, which in colour and markings reminds one very forcibly of the sparrow hawk's, although we procured it from a nest in which were eleven or twelve other eggs of the customary landrail type.

Coupled with this variety in colour there is frequently an abnormity in shape and size. As an instance we make mention of a yellow-hammer's which was found in a nest with three others of the usual size and colouring, but which was scarcely so large as that of the golden-crested wren, and was spotted at the small end with ash colour, the bulk of the shell being of a dirty white, mottled over with yellowish brown.

It is by no means an unusual thing to find thrushes' eggs quite destitute of spots, globular in form, and no larger than a marble; whilst others are sometimes taken with all the spots and markings agglomerated into a blotch at the larger end.

Before we leave the subject of the colouring of birds' eggs we would draw attention to the curious mimetic freaks which are often to be observed in the markings on them. This is well illustrated by a guillemot's in our possession, upon which are depicted most faithfully, in black and sepia, the numbers 10 and 7, and the word Joe. These are by no means hieroglyphics, but are as well executed as many a schoolboy's figures and writing. Upon the same egg are also to be seen rude sketches of heads and several grotesque figures. This curiosity has been exhibited to numerous friends, who have each and all expressed great astonishment at the wonderful mimicry.

There are some eggs which, while they retain their usual colouring, are yet abnormal in shape and size. Of such a description is a house-sparrow's in our collection, which is considerably elongated at the expense of its width; and a friend once shewed to us a hen's egg which much more resembled a large, wrinkled lump of chalk than the production of *Gallus domesticus*.

Newspapers frequently contain reports of abnormally large eggs, but dwarf varieties are quite as common an occurrence. It is, or was, a popular belief in Italy that when a hen had laid about one hundred eggs she laid one or two very small ones and then ceased altogether. Hence dwarf eggs were named "centenine," from the Italian centenina, the hundredth. Dwarf eggs amongst the turkeys and geese are rarities, but are often to be seen amongst the lapwings; whilst instances are recorded also amongst the snipes, red-grouse, blackbirds, thrushes and others. The most interesting case, however, which has come under our personal notice is that of two linnet's eggs which we took from a magpie's deserted nest near Lancaster. They were of the usual colour, but in size were scarcely so large as the blue-tit's. A correspondent in SCIENCE-GOSSIP mentions having had sent to him from the same locality similarly dwarfed linnet's eggs.

This curious situation for bird eggs reminds us that the cuckoo is not the only bird whose eggs have been discovered in the wrong nest; for, besides the above mentioned example, not only have starling's eggs been found in a house-sparrow's nest, but even the wren has been known to deposit her eggs in the nest of the same bird. The eggs of the thrush and the blackbird have been taken from the same nest; while the eggs of the partridge and pheasant, and of the wild duck and the pheasant have been found together in the same nests. The most noteworthy instance however, of this class, that we can call to mind is the following: from a coot's nest were abstracted 7 of her own and 1 moor hen's. A few days afterwards the nest was again visited, when it was found to contain 8 coot's and 2 moor hen's, plainly showing that the two birds shared the same nest.

It is not unusual for solitary eggs to be discovered lying on the grass in the open field, at the foot of a tree, or in other similar unlikely situation. These, on account of long exposure, are often bleached white, and it is then almost impossible to tell the species of bird to which they belong. The possible reason for such curious situations is either the nest has been torn out, or the bird has not been able to finish the nest in time; or, being at some distance from home, has been compelled to drop her egg ere she could reach the nest.

Some curious instances of this class have come under our notice. During one of our early-day's nesting expeditions we lighted upon a siskin's egg impaled upon the sharp thorn of a sloe-tree, and by this means it was "ready-blown." No nest was to be discovered in the vicinity, though a most careful search was instituted. In another of our rambles we found a thrush's egg hidden between two nests. Either the bird had laid the egg before the lining was finished, or it had been left from the previous year's hatching, and a new lining laid over it.

The only other examples of a similar kind that we can find any record of is that of a partridge's which was found covered up by the lining of leaves. In each case the egg was "addled."

A paper on "Bird-egg Curiosities" would scarcely be complete without some mention being made of "double-eggs." These monstrosities are exhibited in at least three different ways: either the egg contains double yolks; or the shell is ridged into two portions after the fashion of twin hazel nuts ; or —by far the greater curiosity—a small, but complete egg is contained within the larger one. Upwards of half-a-dozen of these latter monstrosities are, we understand, to be seen in the Royal College of Surgeons. So far as can be ascertained the following account of a duck-egg monstrosity is well-authenticated : When opened the shell was found to contain two yolks, and embedded in one of these was a second egg, perfect in every respect, but only about as large as a pigeon's.

There is on record another instance of a triple egg, but in this case there were three shells, one within the other. We are not in a position to determine whether the account is correct, but there is every probability of its being so.

T. D. WRIGHT.

33, *Springfield Terrace, Lancaster.*

NOTES ON ECONOMIC BOTANY.

By J. T. RICHES.

LEGUMINOSÆ (GUM ARABIC). — This important gum is the produce of several species of Acacia, natives of Africa. Probably the species most concerned in its production are *A. Arabica*, Willd. and *A. Verek*, Guill., although there is no doubt but what a large proportion of the inferior gum is obtained from *A. vera*, and other species.

A. Arabica, Willd.—A small tree 12–14 feet in height ; spiny ; branches and petioles downy ; pinnæ 4-6 pairs ; leaflets in 10 pairs, oblong-linear, smooth ; petiole with one gland. Flowers in spherical heads. Pod moniliform. It is from this species, or *A. Verek*, that the pure white gum is obtained.

A. Verek, Guill.—A small tree, with smooth branches ; spines recurved ; petiole unarmed ; pinnæ in 3–5 pairs ; leaflets in 6–15 pairs, nearly lanceolate, blunt ; flowers spiked.

The gum was formerly imported from Arabia, but now in far the larger quantities from Egypt. It exudes spontaneously, or is obtained by incisions from the bark. It quickly exudes after incision, and hardens in a short time, becoming darker in colour after exudation. In its purest form it occurs in spheroidal tears, varying from $\frac{1}{2}$–1 inch in length, nearly white, brittle, soluble in cold water.

Dioscorides makes mention of a useful astringent tree, yielding a white transparent gum, which description, brief as it is, well agrees with the tree yielding this gum ; for the bark of the various species possess astringent and tonic properties. Its uses of course are very numerous.

It is used in medicine as a mucilage, and, owing to its adhesive nature, it is largely used instead of glue ; it is also employed in calico-printing, as a thickening material for colours and mordants, and in finishing and dressing operations, although gum Senegal, which is the produce of *A. Senegal.*, growing about Arabia and the interior of Africa, is most adapted for this purpose, because it yields a thicker mucilage.

The wood of *A. vera* is said to be the shittim-wood of Scripture.

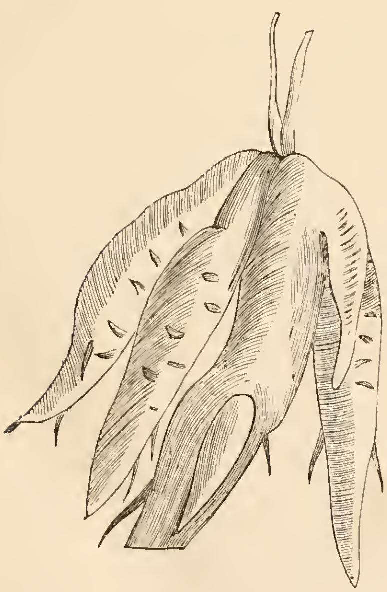


Fig. 10.—Root of *Jateorhiza palmata.*

Fig. 11.—*Acacia Verek.*

Calumba Root (*Menispermaceæ*).—This root is the produce of a plant now known as *Jateorhiza Calumba*, Miers; but was formerly included in the genus Cocculus as *C. palmatus*, D.C.; but have been separated, its characters differentiating from those of Cocculus proper. It is a native of Eastern Africa, about Mozambique, from whence the supply of this country is imported. It has a climbing stem; leaves

Fig. 12.—Leaf of *Jateorhiza palmata*.

circular, palmately lobed with 5–7 entire lobes; leaf-stalks covered with glandular hairs. Root large, fleshy.

Before exportation the roots are taken up, sliced and dried in the sun. They possess tonic, demulcent properties, not stimulants; an extract is prepared from the roots, a solution of which, or a tincture of the roots, is used in cases of diarrhœa, dysentery, or to allay vomiting; but not now used so much as formerly. A figure of the plant is given as pl. 60, *Steph. and Church. Med. Bot.*

NOTES ON THE NATURAL HISTORY OF QUEENSLAND.

THE subject-matter of the following notes has been furnished by my son, Oswald H. L. Slater, who has resided for some years in the interior of Queensland. Many of his observations are unavailable, as the species referred to cannot be identified.

The most conspicuous bird of Northern Australia is the emeu. The number of eggs in its nest varies from nine to fourteen, but two of the number are described as invariably larger than the rest. The meaning of this peculiarity has not been discovered. During the brilliant moonlight nights of Australia, the emeu seems—and, indeed, many other birds seem—to be nocturnal in its habits, and it may often be seen scudding along over the open plains. It is sometimes a puzzle to find the birds in such regions asleep.

The Australian crow differs from the European carrion-crow and the hoodie in being much more gregarious; but it is fully their equal in noise, impudence, and thievishness. It steals the eggs and the young of poultry, and, of course, of the wild birds also. The domestic hen soon learns to lay her eggs in the most concealed localities; but this stratagem, though it often baffles the crow, does not suit the farmer, since, when eggs are wanted, they are not to be found. If the crows find a young lamb away from protection, they pick out its eyes. Hence they are very unpopular among stock-owners. Though many of the marauders are shot, their numbers are so great that it makes little apparent impression.

One of these birds, having been shot, was laid upon an ant-hill, in order that the skeleton might be picked clean by these busy insects. Early the next morning the surrounding trees were crowded with crows, peering down at their dead comrade and uttering angry croaks. This was repeated until the ants had completed their task.

The so-called kite, evidently a different bird from his European namesake, frequents the neighbourhood of human dwellings, like the crow, but does much less mischief. If a bone is thrown to a dog or a cat, a kite is almost sure to sweep past swifter than the wind and snatch away the booty from before the very nose of the intended recipient. The look of mystification on the face of a puppy who has thus been robbed would make a splendid subject for an Australian Landseer. The crow sometimes dances round a kite which is devouring some offal, but without venturing to attack him, and will sometimes venture to hop over him in the hope, doubtless, of drawing off his attention from his meal.

The great black eagle is sometimes beset by a whole mob of crows, who wheel round and round, croaking fearfully, but taking good care not to come within his grasp. Sometimes he will make a dash at his assailants and strike down one or two of the most eager; but more generally he seeks quietness by "screwing" up into the higher regions of the air, where the mob do not care to follow.

The common cockatoo, white, with a sulphur-yellow crest, is very common in Queensland, and takes readily to a domestic life. In the streets of Tambo, Blackall, and other little towns in the interior, these birds may be seen waddling or flying about, going in or out of the houses at pleasure; but never offering to escape. Whether it is the effect of their freer life, or of their native climate, the cockatoos seem here more intelligent and better tempered than in Europe. They climb up men's legs without ever offering to bite.

Among the most curious birds of Queensland are those known familiarly as the "Twelve Apostles," from the circumstance that they are always seen in flocks of exactly twelve—never either more or less. Whether such a little company consists of an equal number of males and females does not seem to be known. But in the nesting season they all build in the same tree, and all feed the nestlings promiscuously. How the number of such a flock is always adjusted is one of the unsolved questions presented of the economy of this bird. It is something like a blackbird in appearance, but of a rustier colour.

The Shepherd's Companion is a curious little bird, which much resembles a wag-tail in its habits. Early in the morning and late at night it is seen flitting and bobbing about the shepherd's hut, or the miner's camp, and is, I believe, never molested.

The Native Companion is a wader, with the usual make and habits of its order. Unlike the shepherd's companion, it is exceedingly shy, and can only be watched if great care is taken, and complete silence observed. Sometimes a group of them—perhaps as many as a dozen—may be seen assembled in a circle, bowing to each other with the utmost gravity, and wheeling about as if going through some quaint, old-fashioned dance. This bird has occasionally been kept in a state of tameness, but it is utterly inadmissible where there are children. It is apt to make a sudden dart with its long beak at any shining object, and has in this manner been repeatedly known to peck out a child's eye.

J. W. Slater.

JOTTINGS CONCERNING CERTAIN FRUIT TREES.

By Mary B. Morris.

Part IV.—The Mulberry Tree.

THE most commonly cultivated species of this tree, that known to botanists as *Morus nigra*, is reputed to be a native of Persia, and is apparently indigenous throughout an extensive range of country.

Several other species have from time to time been cultivated and are still to be found in various localities, but the one above mentioned is that which, from its being considered the most useful, and at the same time the kind which has become best acclimatised in our country, is to us the most familiar.

The mulberry is a tree which has very distinct characteristic habits of its own, on account of some of which it has even been credited with great discernment. Hence, we find that some old writers were wont to call it the "wisest tree," grounding this attribute on the fact of the late period at which it begins to show signs of life in spring. Thus Gerarde says:—"Of all the trees in the orchard, the mulberry doth last bloom, and not before the cold weather in May, at which time the silkworms do seem to revive, as having then wherewith to feed and nourish themselves," &c., &c. Pliny, too, considered it the safe harbinger of spring. "We will here," says he, "give another sign when the cold is gone: as soon as ever you see the mulberry in bud, you have no occasion to fear any injury from the rigour of the weather;" and Evelyn discoursing of this tree in his "Sylva," writes:—"Lastly, let it not seem altogether impertinent, if I add one premonition to those less experienced gardeners, who frequently expose their orange trees and like tender furniture trees of the greenhouse too early: that the first leaves putting forth of this *wise tree*, as Pliny calls it, is a more infallible note when those delicate plants may be safely brought out to the air, than any other prognostic or indication."

We see then that the tree was known in Italy in Pliny's time, and in all probability it had then been long cultivated, though there is some difficulty in tracing its first arrival in Europe; its introduction, as we shall see later on, was, in all probability, of a somewhat earlier date than that of the silkworm.

In China, at a very remote age, the manufacture of silk was practised, and there is no reason to believe that it was carried on (at any rate, to any great extent) from any other material than from the produce of the silkworm fed upon mulberry leaves.

In Persia, too, silk was made for many centuries before the art was known in Europe; and even long after the raw material was brought to Greece, and there by the women spun and woven, it was produced in oriental countries only. The first Greek writer who mentions the silkworm, appears to be Aristotle, who states that the silk was spun in the island of Cos, the silk having been brought from the east; according to Pliny, it came from Assyria, but he uses this name in so very general a sense, that it often merely points to some oriental country or another.

In all probability silk was in use amongst the Greeks long before they knew either whence it came or how it was produced. Virgil supposed that the silk was carded from the leaves of the mulberry tree, and another writer of the Augustan age, Dionysius Periegetes, also imagined it to be a vegetable product, for writing of the "Seres" (the people supposed to make the silk), some lines occur, which are thus translated:

> "Nor flocks nor herds the distant Seres tend,
> But from the flowers that in the desert bloom,
> Tinctured with every varying hue, they cull
> The glossy down, and card it for the loom."

For a long period, the Persians jealously preserved a monopoly of the raw material, which was manufactured by the Phœnicians for the Romans, amongst whom it appears to have been long in general use, but up to the sixth century only by means of this foreign supply. At length the secret of its production became known through two Nestorian monks of Persia, who had travelled in China, and who made the Emperor Justinian acquainted with what they had learned, and undertook to return to China and bring back with them a supply of the eggs of the silk-producing worm. This they did, concealing them in a hollow cane, contrived to hatch them in Constantinople, and fed the young worms with mulberry leaves. So the story runs; and we must therefore conclude that there was no lack by this time of mulberry trees. How early they were grown in Europe, it has been already stated, it is impossible to decide. "We know," says Evelyn, "that till after Italy had made silk above a thousand years, they received it not in France, it being hardly yet a hundred years since they betook themselves to this manufacture in Provence, Languedoc, Dauphiné, Lionois, &c., and not in Orleanois till Henry IV.'s time."

It was not until early in the seventeenth century that any serious attempt was made to introduce silkworms into England and with them the mulberry tree for food. In 1608, James I. issued a proclamation concerning the planting of mulberry trees, in which it was asserted that "the making of silk may as well be effected here, as in the kingdom of France," and persons of influence in the different counties of England were called upon to promote the object of the proclamation, practical assistance being given by sending above ten thousand plants for sale in each county at an almost nominal price, by the issuing of a "book of directions, acts of council and and all other princely assistance." Nor did the king confine his endeavours to Britain, but he used every effort to encourage their introduction into the new country of America. Although the plantations seem to have flourished to a certain extent, our climate proved to be too cold for the silkworms. Still, another effort was made about a century later by the establishment of a company, which obtained a lease, or 122 years, of Chelsea Park. There they planted mulberry trees extensively and erected buildings for the accommodation of the silkworms, but only to end once more in failure; and since that time the only other attempt made in Britain on a large scale was in 1835, when another company planted eighty acres in Ireland (in co. Cork) with four thousand trees, with the result that they soon had to transfer their operations to Malta, the climate again being unfavourable to the success of the undertaking.

Repeated attempts, too, were made in America. Evelyn tells us that the trees were introduced into Virginia, and that "Sir J. Berkely, who was many years governor of that ample colony, told me he presented the king (Charles II.) with as much silk made there, as made his majesty a compleat suit of apparel." Again, in 1789, nurseries of mulberry trees were established in many parts of the United States, but though the trees grew and the climate was not unfavourable to the silkworm, a scarcity of labour and its high rate proved too great an obstacle, and the trade never was fully developed.

The Chinese, for the most part, prefer the white mulberry, *Morus alba*, for rearing silkworms, and the cultivation of the trees has been subject to the strictest regulations from the time of one of their earlier emperors, who made a law which provided, amongst other rules, that every man possessing an estate of not less than five acres, should plant its boundaries with mulberry trees. Nor were the Chinese empresses less zealous in promoting a branch of industry so well adapted for women; they not only set an example by employing themselves in spinning and weaving, but they held festivals with great ceremony, in the autumn, in honour of the invention of silk weaving. Mulberry groves were planted and carefully cultivated within the gardens of the palace, and at the time appointed, the empress with the princesses and ladies of her train, after sacrificing in the Temple of the Earth, proceeded to the mulberry groves, where she gathered leaves, and wound cocoons of silk, which she afterwards spun and wove with her own hands into small webs. These were carefully preserved for their great annual festival (at which was celebrated the return of spring, in the same temple), when they were burned in sacrifice.

The mulberry tree is in China subjected to continual pruning in order that it may produce fine leaves, a practice which tends greatly to deform the trees; the leaves are gathered several times in the year (in some parts of India as many as six times), and though the trees are thus deprived of their foliage again and again, they seem to lose none of their vitality; in fact, the mulberry is a tree remarkable for its hardiness and long life—many of the old mulberry trees still in a flourishing condition in our own country having been planted as the result of King James' proclamation; and the celebrated tree in Shakespeare's garden at Stratford is probably even a little older. It is said that repeated large crops of fruit are never known to exhaust the trees.

The fruit of the mulberry tree is, perhaps, comparatively little used or esteemed, as it is not sweet until so ripe that it drops from the bough, and therefore is seldom brought to table in perfection. Mulberries are sometimes preserved in the form of a syrup, and are also, mixed with the juice of apples, made into a beverage of a deep, rich colour and luscious flavour, which is called mulberry cider. The fruit has also had its medicinal uses, though its virtues would appear to be slight and unimportant, and no longer recognised except in domestic remedies, when either as a syrup or in the form of vinegar, made in a similar way to raspberry vinegar, it forms an agreeable gargle, useful for inflammatory sore throat, or is given as a cooling drink.

Another kind of mulberry, the *Morus sativa*, grows wild in China; from the inner bark of this plant, the Chinese have, for many centuries, made a kind of paper which is used for money in a similar manner to our bank-notes; the invention is attributed to the Emperor Kublai Khan, who had the paper stamped with his own special mark, to counterfeit which was punishable with death.

SOME OBSERVATIONS RESPECTING VEGETABLE PROTOPLASM.

By F. Newham.

I NEVER gaze through my microscope upon that simple, unprepossessing mucilage, known as protoplasm or bioplasm, without feelings in my mind somewhat akin to awe, or in a sense reverence: it is a fact marvellous beyond all conception or imagination, that this delicate substance has done more than almost any other agency to alter the appearance, and even the physical aspect of our planet: protoplasm is not only the vehicle of life, the power that clothes the everlasting hills with verdure, the plains with forests, and peoples the land and water with myriad animal beings—but by a broad yet true generalisation, all the achievements of civilization, of literature, of thought, the productions of art, of mechanical and engineering skill, may be ultimately traced to this one apparently feeble and insignificant source. It may be said without transgressing against reason, that the poetry of Shakespeare, the music of Handel, the genius of Newton, the locomotive that flies along our railways, the cable that transmits thought by lightning from land to land, the mighty cities, centres of civilized life that stud the face of the globe—are alike products of protoplasm! and were the silent ceaseless operations of this factor to be slackened in destruction, that minister to the daily progress of the world, these grand monuments of being and civilization would utterly perish. To the activity of vegetable protoplasm, we are indebted for the heat-energy that moves the machinery of thousands of manufactories, evolving the food-stuffs, fabrics, and articles of utility that contribute to our daily comfort.

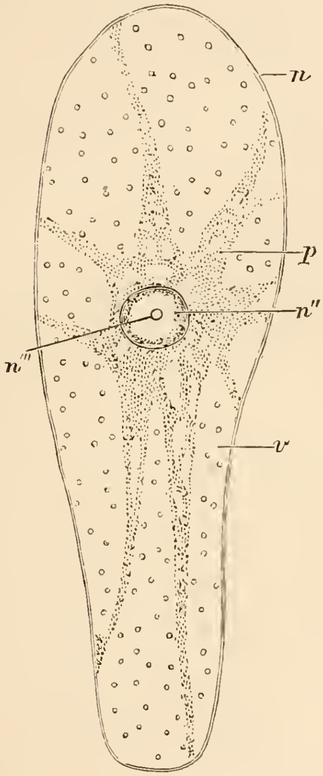


Fig. 13.—Living cell from petal of *Viola tricolor*. *p*, protoplasm; *n*, cell-wall; *n''*, nucleus; *n'''*, nucleoli; *v*, vacuole. (Much magnified.)

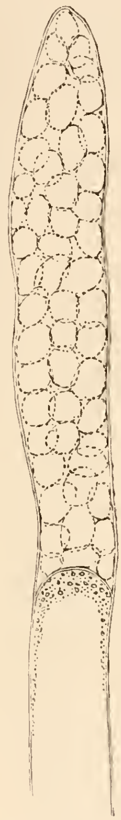


Fig. 14.—Nearly mature sporangium of Saprolegnia. (Much magnified.)

Fig. 15.—Nearly mature sporangium of Saprolegnia; zoospores emerged. (Much magnified.)

In order to study the primary, or elementary form of protoplasm, we must have recourse to the vegetable cell for several reasons, *e.g.*, the physiology of vegetable protoplasm is the simplest form of living function with which we are acquainted; again, without vegetable protoplasm, animal protoplasm could not exist, seeing that animals are sustained by the chemical force, accumulated in vegetable food-products by the activity of vegetable protoplasm. It is very easy to demonstrate the presence of protoplasm in any living vegetable cell, it being sufficient in some cases to mount a portion of tissue in water, when the nucleus, and parietal sac of transparent protoplasm investing the interior of the cell wall are plainly observed. Fig. 13 represents a living hair from the petal of *Viola tricolor* thus prepared; it will be noticed that the nucleus lies embedded in a viscous mass of protoplasm from which protoplasmic streamers or threads extend to the parietes of the cell, being surrounded by the cell-sap in the unoccupied spaces or vacuoles. Protoplasm, when killed by certain re-agents, assumes the appearance of a dense, brownish, granular mass lying loose in the interior of the cell (Fig. 16). Most of its structural peculiarities are by this process destroyed, indeed in one sense it is no longer pro-

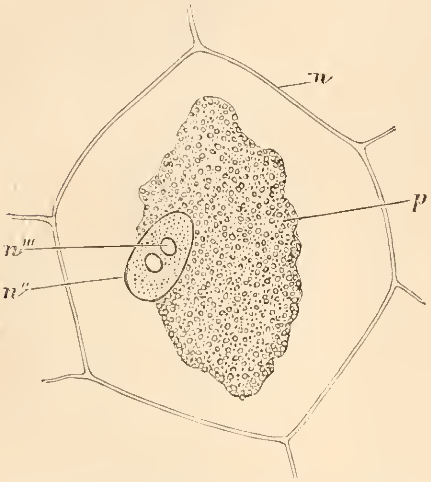


Fig. 16.—Parenchymatous cell from bulb of *Allium cepa*, the protoplasm contracted by acetic acid. (Much magnified.)

toplasm at all, being deprived of the only essential characteristic which distinguishes it from any other nitrogenous or albuminous compound. The shrinking of protoplasm from the cell wall would seem to be an osmotic phenomenon. I have observed that the addition of a simple saccharine solution will cause the protoplasm of the common Alga Cladophora to shrink, and the mere application of water will coagulate the contents of the embryo-sac of *Viola tricolor*. Acetic acid, or alcohol, contract the protoplasm of tissues macerated in them for a short time; the acetic acid contained in ordinary vinegar shows the effect very well.

The motile power of protoplasm is of course very wonderful and interesting; but in the majority of cases it is but slow and ill-defined. The "streaming" arrangement of granules and particles in many cells, would seem to be indications of an imperceptible movement, but the most imposing instances are those of the locomotion of naked masses of protoplasm. In order to witness this very remarkable sight, I here give practical directions from experience: a flea (*Pulex irritans*), newly killed, is to be placed in a wine-glass full of water in a warm place; and in course of a day or two the insect will be enveloped in a white flocculent gauze: this flocculence is a luxuriant tuft of the plant Saprolegnia; now remove the insect bodily to a glass slip, and mount in water for the microscope. The club-shaped, or clavate ends of the hyphæ, will be observed in various phases of development; many will simply consist of a pale granular cord of protoplasm, enveloped by a transparent membranous cell-wall, but in some, a septum will have been constructed across the tubular hypha, thus detaching a mass of protoplasm destined to form a sporangium; and this protoplasm will be found to have resolved itself into a vast number of small globular or oval portions: let such an hypha be particularly watched: probably within a few minutes the apex of the sporangium, or hypha, will dissolve, meanwhile the globes of protoplasm within the hypha seem agitated like a swarm of bees, they seem nervously to crowd and jostle against each other, until they are suddenly released, when, with infinite grace they strike out their fine cilia and steer through the water in much the same fashion as many infusoria. Indeed these zoospores, as they are termed, if their origin were unknown, could not be distinguished by any known characteristic from so-called infusoria.

While protoplasm is generally hyaline or faintly granular in appearance, there are many notable exceptions. Chlorophyll is generally considered to be a coloured species of protoplasm, the zoospores of crimson Algæ or Florideæ are coloured, and the oospheres of our common Fuci are orange-red, or brown. Moreover the protoplasm of pollen cells is generally densely granular, partly from the presence of starch, and oil-drops. Take some pollen-cells from the anther of *Viola tricolor* and mount in water; each cell will speedily swell, becoming globose by the absorption of water by osmosis: presently the pollen-cell will violently discharge its protoplasm, a mass of almost opaque granules forming beautiful festoons in the liquid.

I have observed that the nuclei in our common Orchidaceous plants very easily deliquesce into large granules; they may be well examined in the epidermal cells.

A most remarkable feature of protoplasm is its extreme sensitiveness to external impressions or stimuli: even such feeble vibrations as those of the luminiferous ether, or light are competent to arouse it from a nascent to an active condition, *e.g.*, the elaboration of chlorophyll. It might therefore be expected that the more powerful undulations of heat would profoundly affect it, as is the fact; indeed heat not only produces an invisible molecular activity in protoplasm, but we know that visible protoplasmic movements are affected by it before our very gaze under our microscopes. When protoplasm is protected from the direct influence of external forces, as in the case of buried seeds, tubers, roots, rhizomes, buds, etc., or when the activity or quantity of these external forces are diminished, as in winter, it enters upon a condition in which most of its distinguishing functions are suspended in repose, its marvellous powers become dormant and latent, it ceases to build, construct, increase, or appropriate pabulum, and simply lives; such a nascent condition, in some instances, would seem to be capable of exceeding long duration, I was about to say indefinitely. When we come to speak of that most wonderful plasticity, or shall we say impressionableness, whereby the influence of modifying conditions upon a parent organism are conveyed through the protoplasm of the minute germ to the offspring, we approach the brink of a chasm of profound mystery. Here, for the present, let us stay; without the plasticity of protoplasm, the great evolutionary theory would have no basis whatever. This protoplasm, insignificant and of unostentatious appearance, is invested with potentialities that proclaim it to be by far the most amazing combination of matter within the sphere of human knowledge—potentialities before which mere material bulk and vastness, or even mighty, but dead forces, dwindle into comparative unimportance and inferiority.

ASTRONOMY.

By John Browning, F.R.A.S.

The comet which was discovered at the Warner Observatory, Rochester, N.Y. on the 17th November known as *f.* 1889, was observed at Padua on the 19th, and at Vienna and Palermo on the 20th. The elements of its orbit have been calculated by Dr. Telbe, of the Imperial Observatory, Vienna, who finds that the perihelion passage will take place about the middle of December, at the distance from the sun of 1·19 in terms of the earth's mean distance, and that the plane of the orbit is inclined at an angle of 7° 14′ to that of the ecliptic. The comet is increasing in brightness and is now (December 7th) in the square of Pegasus, moving in a north-easterly direction. Mons. Bigourdan, observing it at the Paris Observatory on the 21st of November, describes it as very faint, nebulous, about 13·4, nearly circular without any marked nucleus.

Mr. S. C. Chandler has published a new determination of the orbit of Brooks's comet (d. 1889), which gives the period 7·04. The aphelion distance is so close to that of Jupiter that when the comet and planet make a near approach to each other, as they did from the middle of May 1886, when the distance did not exceed 0·1 from the end of March to the middle of July, it is probable that the character of the comet's orbit is radically changed by the proximity.

Mr. James Keeler, of the Lick Observatory, has observed with three different spectroscopes applied to the 36 inch refractor, the spectrum of the rings of Saturn and of the planet Atranus. No lines, except those of the solin spectrum could be detected, so that it is concluded that neither of these objects are to any degree self-luminous.

Mr. Brooks, of the Geneva Observatory, N.Y., has obtained some excellent photographs of the recent occultation of Jupiter, which took place on 3rd of September. Although the image of the planet is very small, the belts on the planet can be easily seen on the negatives with a magnifying-glass.

In January, Mercury is an evening star.

Venus is a morning star.

Mars is a morning star.

Jupiter will not be well above the horizon, except in daylight.

Saturn is an evening star, best situated for observation toward the end of the month.

NOTES ON *ACHERONTIA ATROPOS*.

The present seems to be one of those years in which this large insect has occurred rather abundantly in the larval stage. A friend procured three at the commencement of August, and I got one on the eleventh, followed by a pupa on the seventeenth. The larva, which I placed on damp earth in a large flower-pot, burrowed out of sight within half-an-hour, leaving a round hole to mark the place of entrance. The pupa I placed on the surface of the same pot and covered lightly with earth, this it quickly swept off by a quick movement of the tail, and continued to do so as often as it was covered, allowing the earth to remain over a small portion of the fore part only. Remembering that the last year Atropos was plentiful, had an extremely hot autumn, I kept the pot, in a warm place, on the kitchen mantel-piece during the day, bringing it to the end of the fender for the evening and night. A moth emerged from the pupa on the surface on the twenty-ninth of October, the skin was observed to be cracked in that part covering the head and thorax about three in the afternoon, the moth appeared at half-past six quickly crawling out of the pot. I found a slightly inclined stick to suit it, on which it hung from the lower side, the wings were fully developed in an hour, the way in which it shook its head during this period was most grotesque. I put it in a large cupboard. On the thirty-first, it could not be found. After a long hunt, it was at last discovered in the cellar, quite uninjured, though there was sufficient evidence of a close acquaintance with the webs of spiders. I put it in a more secure place, with a lump of sugar moistened with beer, the result was a drunk, the moth fell on its back, legs sticky, necessitating a wash with a camel-hair pencil. Here came a ludicrous scene, kicking and screaming, no attempt to get away, but a resolute fight with the pencil. I must remark that Atropos certainly makes two sounds : the more common resembles the noise made by an imprisoned bee or a large fly held in the hand, it is of short duration ; the other is a squeak.

On the evening of the 1st of November, this moth became so very lively that it was necessary to put it in a large bottle of cyanide to prevent the plumage from being damaged.

To return to the larva first received : one day in the first half of October, seeing a crack near the hole marking its place of descent, I expected an early appearance. On the following day I dug it up, expecting to find the pupa just below the surface, but it was not till I had reached the bottom of the pot that I found it. It was in a chamber the shape and size of a small hen's egg, the sides beautifully smooth. When taken out, the colour was a bright chestnut, which became nearly black after a few days' exposure on the surface of the earth, which I moistened from time to time. On one occasion I thought I heard a sort of grunt from the pupa ; this I found was produced by a rapid sweep of the tail over the earth, for the pupa of this species is far more active, than any other I have seen ; no sound was produced in the hand, or on a smooth surface.

At night, and during the greater part of the day, the pot was covered with a paper cone, made with four thicknesses of newspaper, the bottom tightly tied round the pot, the top fastened with a rubber band, and the middle with a pin. This I thought quite secure. However, the pupa was seen all right, at half-past ten on the evening of the twelfth of November and on the thirteenth the empty case was found and not the moth. The house was hunted from cellar to attic many times without result ; on the following day the earth of a flower pot in a window was seen to have been disturbed during the night. I searched the earth and found an egg, whether of Atropos or not, I cannot say ; I shall be pleased to send the egg to any reader who can identify it for me.

At dusk the moth was found on drawing the curtains, though these had been repeatedly examined during the day. This specimen squeaked freely. To prevent further accidents, I placed it at once in the cyanide bottle, without waiting to make any more experiments. W. A. GAIN.

Tuxford, Newark.

A MUD-CAPPED DYKE.

By the Rev. HILDERIC FRIEND, F.L.S.

AS we take our morning walk during the dreary days of December we naturally think that it is useless to occupy our minds with anything relating to Nature, for all life has been extinguished, and all activity among animals and plants hushed to rest till spring-time again calls it forth. Unless we have more than the usual amount of interest in, and knowledge of, the familiar objects around us, we shall be apt to conclude that any attempt to derive instruction or profit from things so often seen and so well understcod by us as these are, will be useless, and we may as well neglect the appearance of the leafless trees, the brown hedgerows, the seared meadow grass ; thinking only of how much ground we can cover, how rapidly we can walk, how much heat we may evolve, or what we shall do on our return. Thus, unfortunately, to many the days of winter are often days of dulness and monotony, and their enforced or voluntary perambulations in the country yield no such golden return as is reaped in summer days. Yet we are bound to ask, need this be so? Is it true that life is extinguished ? Is all activity at an end? And even if this were so, is there nothing in the familiar objects around us which can serve us for a text or even a lecture? Those leafless trees we saw a few months ago, in their dress of living green, could tell us much that would interest us now if we would examine their buds, scars, bark, or twig and branch arrangements. Under the hedge bottom are many forms of fungoid life with which most of us are still unfamiliar, whose life history and economy we might profitably examine ; while here is a mud-capped dyke, the history of whose name, materials, and tenants, would occupy our thoughts for many an hour.

1. THE NAME.—Some of my readers who live in the South of England are saying : "We never heard of such a thing as a dyke capped with mud, nor can we see how such a thing is possible." They even assert that it is quite evident I don't know what a dyke is, or I should never speak of it thus. Here is a philologist who says : "Look at your dictionary, and you will find that a dyke (or dike) is a ditch (called *dick* in Sussex), or trench, that is, it is something dug out, and so you cannot have a mud-capped dyke." I soon find I have stirred up a hornet's nest. A Sussex friend says : "If you only knew as much about dykes as I do, you would talk with more sense. Don't you know that a dyke is a marsh drain? If you want to know what a dyke is, go out to Pevensey Marsh or Romney, and ask the dyke-reve (the officer who superintends the dykes and drains in marshes)." I have not heard the last word from my angry critic (who little thinks that I have been across as many Sussex dykes as he has), before a learned geologist chimes in : "Sir, if you would only study science as I do, you would soon learn that a dyke consists of cooled lava, which when molten was poured by volcanic action into cracks and cavities already formed in the solid rock. If you will accompany me to the Wrekin or the Lake District, I will soon show you what a dyke is." Very generous ! But I happen to know those localities very well, and have seen the famous dykes of the geologist there. I see, however,

that an honest burly Yorkshireman is waiting for an opportunity to speak, and I will ask him to proceed. "You see, sir, if you understood proper English, you could not speak of a mud-capped dyke, because in our language the word dyke means a pool of water, a pond, or even a stream." And, as though I had not been sufficiently taken to task already, half-a-dozen country folk from various parts of the kingdom rush upon me and say: "Don't you know that dyke is only another name for ditch?" What am I to say? Must I plead guilty, and assure my friends that, before I write such things again, I will make sure that I know what I am doing; or must I stand on the defensive, and try to prove that I am right in speaking of a mud-capped dyke? "You need do nothing of the kind," says a North-country farmer. I knew well enough what you meant, for we have plenty such things in my part of the country, and I reckon we speak as good English as they do anywhere." Bravo! Another champion says: "Let your learned critics only turn over the pages of their provincial dictionaries and they will find such entries as these: "DIKE, a dry hedge (*Cumberland*); a wall (*Scotland*). To DYKE, to enclose with ramparts, walls, or ditches. DYKER, one who builds enclosures of stone."

We thus find that the word dyke, or dike, has the following meanings:—

(1) A ditch or trench, either dry, or containing water.

(2) A pool, pond, or tank.

(3) A wall, embankment, or rampart.

(4) A vein of lava embedded in rock.

It will not, I think, be difficult to show that these forms of dyke are each entitled to the name; and this we can do graphically and historically. Thus—

Dyke .	Dry ditch .	Embankment; earth cast up. Rampart, military defence. Wall made of earth, then of stone. Wall formed by lava.
	Wet ditch .	Marsh drain—still or flowing. Pond or tank, dead water. Stream, or living water.

If now we take the word and examine it historically (or, which is much the same thing, etymologically), we shall arrive at the same result. The provincial and literary forms, ditch, dike, dyke, dick, dik, diche, all point back to an earlier form, which in Anglo-Saxon was written *díc*. In our modern word ditch the final letter has been softened or weakened, but in the other forms of the word the final letter has retained the power and value of *k*. Now in Anglo-Saxon the word *díc* meant a ditch, mound, bank, moat, trench or foss. The same word is found in the Scandinavian languages (Swedish *dike*, Icelandic *diki*, Dutch *dijk*, Danish *dige*), with a similar meaning. In German, where it is written *Teich*, it means a pond or pool (as in Yorkshire); in Greek it is *teichos*, a wall (as in Cumberland and Scotland), and thus we reach the Sanskrit form *dehî*, a wall or rampart. Here, however, we find ourselves on not only classical, but sacred ground, for our word dyke having been traced back to India, we now learn that in early times the root from which it springs gave rise to other interesting shoots and branches. Perhaps the most interesting word for us, which is associated with the word dyke, is the familiar term Paradise. Let Professor Max Müller, in his inimitable style, tell the story.

"After the phonetic laws of each language had been more carefully elaborated, it was but too frequently forgotten that words have a history as well as a growth, and that the history of a word must be explored first, before an attempt is made to unravel its growth. Thus it was extremely tempting to derive *paradise* from the Sanskrit para-de*s*a. The compound para-de*s*a was supposed to mean the highest or a distant country, and all the rest seemed so evident as to require no further elucidation. Parade*s*a, however, does not mean the highest or a distant country in Sanskrit, but is always used in the sense of a foreign country, an enemy's country. Further, as early as the Song of Solomon (iv. 13), the word occurs in Hebrew (see marginal reading) as *pardés*, and how it could have got there straight from Sanskrit requires at all events some historical explanation. In Hebrew, the word might have been borrowed from Persian, but the Sanskrit word parade*s*a, if it existed at all in Persian, would have been *paradaesa*. Such a compound, however, does not exist in Persian, and therefore the Sanskrit word parade*s*a could not have reached Hebrew *viâ* Persia.

"It is true, nevertheless, that the ancient Hebrew word *pardés* is borrowed from Persian, viz., from the Zend *pairidaêza*, which means a piece of ground enclosed by high walls (*circumvallatio*), afterwards a park, a garden. The root in Sanskrit is DIH or DHIH, and means originally to knead, to squeeze together, to shape. From it we have the Sanskrit *dehî*, a wall, while in Greek the same root, according to the strictest phonetic rules, yielded *toichos*, wall. In Latin our root is regularly changed into *fig*, and gives us *figulus*, a potter, *figura*, form or shape, and *fingere*. In Gothic it could only appear as *deig-an*, to knead, to form anything out of soft substances; hence *daig-s*, the English *dough*, German *Deich* (Chips, iv. 23)."

It is beside my present purpose to pursue the history of this common but interesting word further. It will suffice that our mud-capped dyke has led us gradually in thought to Paradise itself, and no one will complain that a journey is tedious when it terminates so happily as this.

Our reflections, however, have only now commenced, and having explained what a dyke is, it is necessary ere we proceed further to explain the sense in which the word is here employed. It is well-known to many of my readers that in various parts of the country the cheerful hedgerow is supplanted by unsightly walls which are frequently built in very rough style out of the loose stones found on the land, or from similar materials from a neighbouring quarry. If in a few instances the walls are neatly put together, and the joints mortared, in many cases no mortar is employed, but the wall is dry-jointed; whence the Scotch term "dry-dyker," or one who builds stone walls without mortar or cement. Here, in Cumberland, one may see miles of such dykes, both in the open country and on the Fell-sides (as the people term their hills); and as a rule they consist of stones of various shapes, sizes, and qualities, piled one upon the other with some amount of care if not of skill, and surmounted by a coping or cap of mud and small stones. Thus a mud-capped dyke is simply a rough wall serving as a fence, hedge, or boundary, made either with or without mortar, and kept together by means of a cap of clay or earth which has been kneaded, beaten, or made stiff and impervious to the rain.

We shall next have to examine this clay and these boulders or "cobbles" a little more closely, and if possible trace their history, and then examine the various forms of life which are to be found located there.

Carlisle.

SCIENCE-GOSSIP.

Mr. J. B. Beckett, Secretary of the Great Yarmouth Naturalists' Society, sends us a copy of a list of "The Mollusca of the Great Yarmouth District." This is the first list of the district which has been compiled, and, as the species named have all been found by Mr. Beckett himself, it does him great credit.

A New method of preparing Fluorine has been discovered by M. Moissan. A capital account of it appeared in "Nature," December 5th.

A "Gilbert Club" has been founded in honour of Dr. Gilbert, of Colchester, the author of "De Magnete." Sir Wm. Thomson is President, and all the leading electricians of the day are members. One reason for the club's existence is to republish an English translation of "De Magnete," after the style of the 1600 folio edition.

Manchester has resolved to put up a memorial to the late Dr. J. P. Joule. It has been resolved to erect a marble statue to the deceased, and a committee has been appointed to carry out the object in view.

PHOTOGRAPHY.

The following good hint for utilising old or spoiled negatives appears in a recent number of "Work":— Old negatives may very easily be turned into printing frames, or rather printing contrivances, for there is no frame needed; but we will call them frames for convenience. To make a printing frame for half-plate photos, we only require two old quarter plates. Cut a piece of strong black linen a little larger than two quarter plates placed side by side, and paste them down securely in that position to the linen; place this on a flat surface, and lay a heavy book, etc., upon them until quite dry: then trim off the linen to the exact size of the glass with a sharp knife. Next procure four spring clips, as used for fastening clothes on a line, and the printing frame is ready for use. To make a print, place a piece of sensitized paper of the required size upon the negative, and then a piece of white blotting-paper, half-plate size, upon the back of the print. Next lay the quarter plates hinged with black linen, glass side down, upon the blotting-paper, and secure with the four clips, placing two at each side of the frame, so that each half of the folding back shall be firmly held in position. The print may be examined by removing the clips from one end and raising the half, as in the case of an ordinary printing frame. For carte-de-visite size, a quarter plate cut into equal parts, and for printing from whole-plate negatives, two half plates, backed with linen as above, may be used; for the larger sizes eight clips will be required in order to ensure perfect contact between the print and negative.

A Photo-Microscope.—Mr. R. G. Mason draws our attention to Leach's Improved Oxyhydrogen lantern microscope, suited for microscopic projection, for exhibiting the phenomena of polarized light upon the screen, or for photo-micrography.

Photo-etching.—We have much pleasure in drawing the attention of those of our readers interested in the matter to a new method of photography. Messrs. Sharp & Hitchenough, of 101 and 103, Dale Street, Liverpool, send us specimens of their "Aptus" etching plates. The object of this new invention is to provide a means by which artists, especially ladies, may make etchings by a very simple and inexpensive process. Acids are dispensed with, as also the litho and copper plate press, moreover the ease of manipulation is apparent when the plate is etched upon, the image or drawing is not seen reversed, as in copper-plate etching. By putting the plate on a dark background, such as a piece of black cloth, the lights and shades are seen as in the print; this necessarily makes the process of glass-etching much more simple, especially for amateurs. In the box with the plates is supplied sensitized photographic paper, which is known as sepia-type. By the simple means of printing by light under the etched glass negative in a pressure frame, the etching is reproduced on the paper, after which nothing further is necessary but to treat the print with several changes of water into which a few drops of a saturated solution of hyposulphite of soda is added.

When rinsed and dry the prints are permanent and of a pleasing tone, and hardly distinguishable from genuine copper-plate etchings. Any of the ordinary photographic processes may be adopted for printing. For commercial work the glass etchings are far in advance of any other method of producing photo-lithograph and photo-relief blocks for letterpress printing.

PHOTO-MICROGRAPHY.—I have tried photo-micrography as suggested by your correspondent, Mr. Dean, in SCIENCE-GOSSIP for last February, and have been most successful. Of course the principal difficulty is in getting the right length of time for the exposure, but one soon gets into the right way.—*P. Tracy, Ipswich.*

MICROSCOPY.

THE ROYAL MICROSCOPICAL SOCIETY.—Rev. A. Hall exhibited a bacillus from urine which closely resembled *B. tuberculosis*.—Mr. Hardy exhibited and described a little apparatus which he had devised for the purpose of photographing an object under the microscope without having to alter the position of the instrument in any way. He had originally made it in metal, but had found it too heavy; the one now before them was made of wood, and weighed about one ounce, the cost being nothing at all beyond the trouble of making it.—Mr. Watson exhibited and described a new pattern microscope for students ("The Edinburgh Student's Microscope") and a student's petrological microscope made upon the same lines; also a small box for holding slides, for which a patent had been obtained by Mr. Moseley, its inventor.—Mr. Crisp exhibited apparatus by which it was proposed to convert a microscope into a microtome by placing the embedded substance in the lower end of the tube, and cutting sections by means of a blade fitted to move upon the stage plate.—Mr. J. Mayall, jun., described the various microscopes and accessories which he had examined at the Paris Exhibition, pointing out that whereas at former international exhibitions most of the best makers in England, America, and other countries were exhibitors, on this last occasion they had been rather conspicuous by their absence. The French opticians were fairly well represented as to numbers, but the instruments they exhibited were, for the most part, of the old, not to say antiquated, types. He had seen very little that was new in the matter of design.

A NEW MICROSCOPE.—Our contemporary ("Research") states that a new microscope has been invented by Dr. E. Schulze, director of the Zoological Institute at Berlin, and is called a "horizontal microscope." It rests on a perpendicular stand, and its chief feature is an aquarium, which contains the object to be examined. The aquarium is a cavity made of panes of glass, lit by reflected light from a movable mirror. The cylinder of the microscope can be brought into three different positions by means of screws, and moved in all directions to enable an examination of every part of the object. For watching small moving animals this new instrument will be most useful.

EMBRYONIC ROTIFERS.—With reference to Dr. Barnett Burn's query, in his article on *Philodina tuberculata* (SCIENCE-GOSSIP, Dec.) as to the position occupied by the embryo rotifer within the parent, the following note made by me just a year ago may be of interest in affording an answer. In a Rotifer ("vulgaris," I believe) that I had under observation during some three hours, and in which a well-developed fœtus was present, the position of the latter relatively to its parent was several times changed, the head of the embryo being, when first noticed, in the same direction as that of the parent, afterwards turned towards the opposite extremity of the latter's body, again brought back to its original position, and finally again reversed. The embryo was large and perfectly formed, exhibiting well its two eye-spots and the ciliary action within its pharynx, and working its trophi intermittently. I think this observation alone (though doubtless often confirmed by others), will prove that the position of the fœtus in the viviparous Rotifera is not at all constant within the adult, at any rate during the later stages of development, and that this, therefore, can be of no use whatever as a means of classification.—*P. Thompson.*

THE October number of the Journal of the Royal Microscopical Society contains the following papers: "Description of a New Species of Megalotrocha," by Surgeon V. Gunson Thorpe, R.N. (illustrated); "Note on Polarizing Apparatus for the Microscope," by Professor S. P. Thompson, D.Sc., and also the usual "Summary of Current Researches."

ZOOLOGY.

CUCKOO AND WAGTAIL (misprinted Magpie in last number of SCIENCE-GOSSIP).—J. A. Smith may be assured that it is by no means infrequent for the cuckoo to make use of wagtails and other birds as foster-parents as well as hedge-sparrows. A few years ago, walking round a friend's garden, near Ross (Herefordshire), I noticed two unfledged birds lying dead at the base of the wall. On looking closer under the shade of a potato stalk, I discovered the nest of a pied wagtail built a few inches in the ground, in a cavity where a stone had fallen out. In the nest was a robust young cuckoo, and at a little distance one of the old wagtails waiting with an insect in its bill ready to drop into the mouth of the usurper, about whose welfare they were more concerned than the fall of their own progeny decaying close to the comfortable home from which they were ejected. Another point about which there can be no doubt is that the position of the nest made it quite impossible for the cuckoo to lay the egg. The probability is that it was placed there by the mouth. The construction of the foot with the opposed toes similar to the woodpecker's, are very applicable for grasping, but perhaps it is hardly likely the foot would be used for the removal of the egg, the mouth is much more possible.—*E. Wheeler, Bristol.*

THE RUDIMENTARY INTELLIGENCE OF THE INFUSORIA.—A correspondent, signing himself "H." takes exception to some of the arguments contained in the article of mine on the above subject which appeared in the November number. "Mr. Deane," he writes, "appears to contend that instinct is an outcome of intelligence. Is not rather intelligence a higher development of instinct?" My contention was simply this, instinct in an individual must imply a power of reasoning; it matters not whether that reasoning was performed by the individual or by an ancestor. It must have been performed at some time, and its performance involved the possession of intelligence. "H." contends that the reasoning was done by an ancestor, and transmitted to all his descendants, so that their actions have become purely mechanical. The supposition that each successive individual has a small intelligence of his own, is to my mind more satisfactory than the theory that there was once a preternaturally wise ancestor who did all the thinking for himself and all succeeding generations. But in either case, the main contention of my article is unaltered; namely, that the Infusoria show far more intelligence than is compatible with their place in the structural scale of creation, if we are still to regard the mental development as necessarily corresponding with the physical. "H." concludes thus: "It does not seem to be necessarily a question of intelligence or instinct at all; a mere mechanical advantage would have the same result if transmitted." What precisely is a mechanical advantage? And wherein does it differ from instinct?—*A. C. Deane, Clare College, Cambridge.*

EGGS COLOURED AT SMALLER END.—Mr. Nunn, in his interesting paper, "The Colouring of the Eggs of Wild Birds at the Smaller End," states that amongst 1000 specimens of the eggs of the house-sparrow, there is not one coloured at the wrong end. I have seen two so marked, one, which I still possess, I found rather late in the summer of 1887. The next was beneath a tile in an out-house.—*P. Tracy, Ipswich.*

THE HEARING OF ANTS.—Both Mr. Bowman and Mr. J. W. Williams are rather hard on me for my remarks anent the hearing power of ants. The former would like to know what the ants themselves thought of "my attempt to rob them of their organs of hearing?" The latter (Mr. Williams) says that I think ants do not hear. In reply to Mr. Bowman's strictures, I may say that I never have attempted to rob them of their sense of hearing. It is a well-known fact that Sir John Lubbock has experimented with ants, and has come to the conclusion that they do not hear. I read Mr. Bowman's article on the Wood-ant, and he says that ants do hear. Very good, then; the question is an open one, and I for one, side with Sir John Lubbock in that it is probable that ants do not hear, and I put forward the theory that the vibrations of a sonorous body might be conveyed to their organs of touch, and thus give an observer the idea that the insects had really heard the sound, when such, perhaps, was not the case. In my short article I was careful also to say that we must not infer from these experiments that ants are deaf to all sounds. Their range of hearing may be different to ours; they may hear sounds that are caused by perhaps less than a vibration frequency of 28 per second, or by one of more than 3,800, sounds that would be inaudible to us human beings. Now Mr. Williams thinks there is no doubt at all about the question, and he gives as his reason that auditory organs have been demonstrated in all the Insecta except the Thysanoptera. It is all very well to tell us this, but I ask "How do you know these 'chordotonal' organs are really 'auditory' organs?" There may be 200 or 2000 of these so-called auditory organs, and I then still doubt whether ants really do hear. However, what I have said is open to criticism, and if any one can overthrow my theory in an argument that is patent to me, I will no longer defend it.—*Chas. A. Whatmore, B.Sc. (Int).*

A LIST OF THE BRITISH DIPTERA, by G. H. Verrall, F.E.S. (London: Pratt & Co.). A list like the above has long been wanted by the collector. Mr. Verrall is very careful in accepting doubtful British species, and sets his face steadfastly against the unnecessary manufacture of species and varieties. We heartily recommend this list to those of our readers who are interested in the study of Diptera.

BOTANY.

LINUM PERENNE, L.—In the summer of 1888 I was staying near Godshill, in the Isle of Wight, and in a field near the house I found a species of Linum which I am tolerably certain was *L. perenne.* The exact place was at Blake Down, about a mile or more from Godshill. The hill is for the most part covered with a large common, but at the south end the ground sloped down to the road in a large grassy field, and in one corner of this the linum was plentiful. A few scattered plants grew elsewhere. I do not pretend to have any great knowledge of the British Flora, and it is possible the plant in question was *L.*

angustifolium, though the flowers seemed to me too large. I did not see it anywhere else in the island. I am sorry I have no specimens, but perhaps some Isle of Wight reader can tell me if I am right or wrong.—*H. J. Perrett*, *Farnham*, *Surrey*.

ORIGIN OF FLOWERS.—In the theory of the origin of flowers, the origin of sexes in plants cannot be left out. Most flowers have their male and female organs continued within the same corolla, or, at any rate, they exist upon the same plant. The philosophical botanist is led to speculate upon the long line of influences, physical and biological, which in the past period of the earth's history caused flowers to assume so many different sexual characteristics. Recently it has been discovered that even the enemies of plants —such as parasitic blights and mildew—may, in the long run, affect the floral characters of plants. I observe that one of the most painstaking of our experimental botanists has recently submitted to the scientific committee of the Royal Horticultural Society the results of some observations and experiments which bear upon this interesting subject. He artificially impregnated a female specimen of our common white Campion with spores from a parasitic fungus (*Ustilago violacea*) he found growing on the anthers of a male plant of the red Campion (*Lychnis diurna*). The hybrid offspring raised therefrom were perfectly healthy, but the female parent plant itself (*Lychnis vespertina*) bore nothing but male flowers in the following year, and every one of these was affected by the parasitic fungus above mentioned. In the discussion which followed the reading of the papers, it was argued that whatever tends to lessen the vitality or vigour of the female floral organs may heighten those of the males, as occurs frequently in hermaphrodite flowers. When flowers are abnormally sexual, then the lost sex may appear should the energy be diverted from the sex usually present. Further, that if the constitution of the flower be weakened, as by the attacks of a fungus like that above mentioned, then the plant may be one capable of forming stamens, as the male sex is often correlated with a lessened degree of vitality.

ERRATUM.—On page 278 (No. for December, 1889), second column, line 3, for 1889 read 1884.

GEOLOGY, &c.

IMPORTANT DISCOVERY OF FOSSIL INSECTS.—At the last meeting of the Entomological Society of London, Mr. H. Goss read a communication received by him from Professor S. H. Scudder, of Cambridge, Mass., U.S.A., on the subject of his recent discoveries of some thousands of fossil insects, chiefly Coleoptera, in Florissant, Western Colorado, and Wyoming. Professor Westwood remarked on the extreme rarity of fossil Lepidoptera, and called attention to a recent paper, by Mr. A. G. Butler, in the Proc. Zool. Soc., 1889, in which the author described a new genus of fossil moths belonging to the Geometrid family Euschemidæ, from a specimen obtained by Mr. A. Court Smith at Gurnet Bay, Isle of Wight.

WINDS AND STALACTITES.—It may be interesting and instructive to many of your readers to notice how the prevailing direction of the wind is recorded by stalactites, a cross section of which will often reveal an eccentric structure, due, undoubtedly, to some external agent—which can be no other than the wind —blowing against the moist cone, causing the greater part of the external watery layer, which is charged with calcareous matter, to be carried to, and, ultimately, set on the side opposite to that from which the current comes, thus causing a greater amount of deposition of matter on one side than the other, *i.e.*, if the prevailing current be from a northerly direction, the greater radius will be towards the south side of the stalactite, and *vice versa*, and this, at different parts of the cone, will be found to vary, as the wind veered. It will also be noticed that the layers in the greater radius are somewhat loose and cancellated, while those of the shorter one are thin and compact. —*G. Rees*, *Aberystwyth*.

A NEW FOSSIL REPTILE.—At a recent meeting of the Zoological Society, Mr. R. Lydekker read a paper on the remains of a theriodont reptile from the Karoo System of the Orange Free State; the remains described were an associated series of vertebræ and limb-bones of a comparatively large theriodont, which was probably different from any described form; the humerus was of the normal theriodont type, and quite distinct from the one on which the genus Propappus had been founded, which the author considered to belong to a form closely allied to, if not generally identical with, Pariasaurus.

NOTES AND QUERIES.

COLOUR OF EGGS.—Concerning the removal of the colour of eggs—I was washing a turkey's egg and not using any undue pressure, when I found a large portion of the reddish-brown spots had disappeared, and the egg had a very patchy and spoilt appearance. —*A. Whitworth*, *Southport*.

THE HORNIMAN MUSEUM.—There are Museums and Museums, the term being of such all-embracing significance as to be applicable to any repository of curiosities whatsoever, from the wax-work effigies of Madame Tussaud to the vast aggregation of treasures constituting the British Museum. One of the completest collections of interesting objects gathered together by any private individual, however, is that of Mr. F. J. Horniman, at Surrey House Museum, Forest Hill, where the owner's cultivated taste and well-directed research are represented by a display of valuable objects, every one of which has some story to tell, or some instruction to convey. The garnering of these treasures from all the ends of the earth has been to Mr. Horniman a labour of love for many years, and, with a generosity worthy of wide imitation, he has permitted the public to visit the Museum from time to time, providing a staff of attendants, and offering the fullest facilities for the enjoyment of his visitors, who at holiday time have come in their thousands. It would be impossible within a limited space to do more than indicate a few of the leading features of the Museum. The handsome Reception Room has a very Asiatic aspect, from the many curious-carved objects which adorn it, comprising Chinese Chairs inlaid with pearl, a wonderfully elaborate Japanese Screen, on which the adventures of a priest are depicted, and a profusion of other artistic works in which the skill and patience of Eastern artificers are strikingly exemplified. The autograph-hunter will here find a little paradise, there being five large autograph-albums open to his inspection, containing examples of the caligraphy of the world's celebrities, including Napoleon I. and Barnum, Queen Victoria and Thomas Carlyle, Bismarck and John Bright, with hundreds of others. Passing forward to the Entrance Hall and Staircase, the eye is attracted by huge pieces of Japanese Embroidery, a collection of Hebrew Manuscripts, and other relics of ancient days. Then we arrive at the Orchestral Organ Room, the chief object of which is a gigantic organ which contains secreted in its inner recesses the counterparts of 78 instruments, with drums and cymbals added, all ready at the touch of a spring to burst into orchestral harmony, and play operatic and other selections with the accuracy and power of a Covent Garden band. A number of draped Indian figures are arranged in proximity to this monster instrument, seeming to have been struck dumb by constant listening. Proceeding to the Oriental Figure and Dress Room we see a further collection of strange figures; then in the Old English Chambers we have a collection of antique objects, illustrating the habits and customs of "Merrie England" in the olden time; there is also a Bible and Manuscript Room, deeply interesting to the Scriptural student, containing, as it does, examples of most of the rare and curious Bibles so dear to the collector; and in an Antiquities Room the visitor can inspect specimens of Greek and Roman antiquities which will be found of the greatest interest. Other rooms are, the African and Japanese Room, the Bird Saloon, the China and Porcelain Rooms, and the Long Saloon, the latter comprising a Natural History collection of immense variety and value. Altogether, the Museum contains many thousands of objects. The Museum is open to the public, on Wednesday and Saturday afternoons, by cards of admission to be had from Mr. E. D. Watkins, the genial Curator, 100 London Road, Forest Hill; and Mr. Horniman permits also natural science classes, or parties interested in the works of nature and art, to go over the Museum under the charge of the curator.

FLOWERS were used by the clergy for making their *corona sacerdotalis*—the sacred crown worn by the canons and clergy of cathedrals and churches. At high festivals and on other solemn occasions the priests walked from the monastery to the parish church in procession, crowned with roses, honeysuckle, and other flowers. Thus we read in a fifteenth century manuscript of Roger de Walden going to St. Paul's in solemn procession to be enthroned in his episcopal chair, with a crown of red roses on his head. Polydore Vergil (early sixteenth century) also refers to the same custom. "At the present time," he writes, "with the English as elsewhere, the priests on stated and solemn occasions appear at public services of the church with garlands on their heads, and especially the priests of St. Paul's at London, who, at the feast of St. Paul, in the month of June, are crowned for the celebration of all the sacred offices proper to the day." Stowe also records a procession from St. Paul's when "the Dean and Chapter, apparelled in copes and vestments, with garlands of roses on their heads, issued out at the west door." It is, however, in fifteenth and early sixteenth century churchwardens' accounts that we have the clearest testimony of the prevalence of this old custom. How long the custom of wearing the *corona sacerdotalis* prevailed in England is not known, but it probably was discontinued at the time of the Reformation.—*From a History of English Gardening in the "Gardeners' Chronicle," Nov.* 2, 1889.

A PROLIFIC KESTREL.—While making a collection of birds' eggs some time ago, I robbed the nest of a kestrel of four newly-laid eggs on the 15th of May, and after an interval of twenty-one days, I again robbed her of five eggs. I blush to tell this, the kestrel being a favourite of mine, but the eggs of this individual were so pretty I could not resist the temptation. But to my great relief when I visited her nest three weeks after, it contained other six eggs from which six young kestrels were successfully reared. The three sittings of eggs were all laid in the same nest which had done service on a former occasion; it was built in the fork of an old fir tree. I could easily identify the same female by one of her middle tail feathers being gone. Although I cannot advocate the wholesale plunder of nests, the clutch collector will find an excuse here, as bird life was increased in this instance.—*W. Sim*, *Fyvie*.

STAG-BEETLES.—Is it a usual thing for a stag-beetle to show a preference for an individual? Accidental circumstances made me keep two of these creatures for some weeks this summer. The male became an amusing and intelligent pet—the female was tame with the tameness of stupidity, but her mate, though quiet with moss, invariably left grass, hand or tree, evening or day, for my finger, where he would remain contented while I wrote or gave orders in house or garden. He was a fair-sized specimen, in good health, and never used his mandibles on me unless I gave him food not to his taste, when he promptly threw it down and pinched me. His ways were most amusing; but this is a query, not a description, so I only repeat: Is such a trait usual in the stag-beetle?—*T. G. A. Tribe*.

VANDAL NATURALISTS.—May I ask your correspondent, Mr. Arthur Hollis—who appears to be an authority on the migration of birds—how many instances he can give from personal observation of birds continuing to lay to make up the clutches after a portion, say two, of the eggs have been taken? I believe there are some few cases on record of birds continuing to lay, but in this locality I have never been able to induce a bird to lay beyond its normal number of eggs, all my experiments ending in having the eggs left forsaken. I believe the great majority of nests are forsaken when the clutches are disturbed by pilferers. The physical strain from a bird having to lay a second clutch is nil, or the poor hens which supply us with our daily egg for breakfast would soon all die of inanition. Lastly Mr. Hollis asks, When does the bird's chance begin to come in? My answer to this is, When mawkish sentimentalists are prevented carrying on their baneful practice of pilfering an egg or two from every nest they find.—*Joseph P. Nunn*, *Royston*.

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

F. C. Long.—For information as to stocking and keeping a marine aquarium (and also fresh water kinds) consult Taylor's "Aquarium," published by Messrs. W. H. Allen & Co., Waterloo Place.

Wm. Mervyn (Isle of Man).—We shall be pleased to insert your offer of fossil corals, &c. Get Taylor's "Common British Fossils" (published by Chatto & Windus) which will help you to a knowledge of them.

H. W. Lett.—The Botanical Record Club is still in existence, and doing good work. Address, Mr. Charles Bailey, F.L.S., Ashfield, College Road, Whalley Grange, Manchester.

Edinburgiensis.—We quite agree with you as to the numerous errors which appear in Adam's "Beautiful Shells," but it is hardly worth while doing other than just calling attention to the fact.

Professor Phillips.—The papers on "British Hepaticæ" were published as supplements of Science-Gossip, abundantly illustrated, in 1865, price 4*d*. Its issue has long been out of print, but Mr. W. Collins, 157 Portland Street, might procure you a copy.

T. W. D. M.—The address of Mr. E. D. Marquand is Fermain House, Guernsey.

F. Wilson.—Your discovery as to the sensitiveness of gas-jets at high pressure to musical notes is not new. Professor Tyndall and others nearly twenty years ago described what they called "musical flames," and we have seen a gas organ based on this principle in which the tubes were composed of glass, and different lengths of flame and different musical notes were so arranged that simple melodies could be played with them.

A. C. S. (Trenton, U.S.A.).—The address of the Editor of the "Journal of Microscopy," the organ of the Postal Microscopical Club, is 1 Cambridge Place, Bath.

H. B. Booth.—Get the "Feuille des Jeunes Naturalistes," published monthly at 2½*d*. Paris: M. Adrien Dollfuss, 35 Rue Pierre-Charron.

"Pliny."—The "Ray Society" is still in active existence. The President is Sir John Lubbock; the Hon. Sec. Professor Wiltshire, (to whom apply) address, 25 Granville Park, Lewisham, S.E.

Beetles.—We have received queries concerning two small British beetles from a correspondent whose name has been mislaid. Both are common kinds: 1. *Phædori tumidulum*; 2. *Aphrodius prodromus*.

EXCHANGES.

Offered, *Helix nemoralis* from this locality. Wanted, *Helix nemoralis* and *Helix hortensis* from England.—James H. Morrison, Lexington, Va., U.S.A.

Diatoms.—Slides of various fossil deposits offered for others not in collection, mounted or rough (latter preferred). Loch Kinnard diatomaceous earth offered for other good material.—Wm. Goodwin, 3 Lynedoch Street, Glasgow.

Two side-blown eggs each of the ruby-throated humming-bird and mottled owl. Osprey and others offered in exchange for rarer British or foreign eggs; full data with all. Please send lists to—H. B. Booth, Parkfield Terrace, Frizinghall, Shipley, Yorks.

Wanted, good secondhand egg cabinet of the largest size. —H. B. Booth, Frizinghall, Shipley, Yorks.

Wanted, good microscope by Ross, Dallmeyer, Swift, Beck, or Wray. Offered, collection of the rarer British plants, expensive works on botany, camera, lens, and complete photographic outfit, or state requirements.—H. Fisher, 26 Stodman Street, Newark.

Wanted, "Nineteenth Century" for May, 1886.—R. B. Postans, 14 Emys Road, Eastbourne.

Brehm's "Bird Life," clean as new, in exchange for microscopic lamp, or offers.—R. J. Payne, 13 Millfield Road, Yorks.

Telescope, with case complete, in exchange for microscope or violin.—W. Turnbull, 1 Horne Terrace, Edinburgh.

Offered, six different varieties of cactus, all young and in good condition, in exchange for micro slides or unmounted objects.—J. T. Holder, 18 Casella Road, Hatcham.

What offers for bound vols. of Science-Gossip, 1874–9, inclusive, good as new?—T. R. Neve, Wittersham, Kent.

Wanted, good microscopic slides of natural history objects, in exchange for fine and well-set Davus, Artaxerxes, Mundana, Alniaria, Ribesaria, and many other northern forms.—John Mundie, 22 Watson Street, Aberdeen, N.B.

Wanted, flowers, insects (any order), nummulites, &c., from the Riviera, also Mediterranean diatoms. Offered, British dried plants, selected diatoms, &c.—G. H. Bryan, Chaucer Road, Cambridge.

Wanted, Science-Gossip for 1884 and 1885 (with plates), in exchange for good micro slides, or first twenty-two numbers of "Cassell's Popular Educator."—O. T. Elliott, Belgrave, Leicester.

Offered, stained botanical preparations for any injected animal organ in mass.—W. White, Litcham, Swaffham.

Offered, twelve old copper coins, tokens, &c., and a silver three-halfpenny piece of William IV. Wanted, four botanical micro-slides.—Geo. Parish, 124 Kingston Road, Oxford.

Wanted, fossils from all formations, in exchange for electric apparatus; also, "Star" microscope wanted.—Bert. Daw, Malvern House, Casey Street, Reading.

Wanted, selected diatoms, whole insects, or geological sections, in exchange for gem air-gun, telescope, air-pump, ¼th inch objective, &c.—H. Ebbage, 344 Caledonian Road, London.

What offers for an interesting book on "British and Foreign Ferns," by J. Smith, A.L.S. Wanted, shells, fossils, or books. —Miss Plumb, Monmouth Street, Topsham, S. Devon.

Whoever will send three species of British fossils (if large, one specimen; if smaller, two or three specimens, at discretion of sender), will receive in return two micro-slides, or one dozen packets of material. If extra good fossils are sent, exchange will be arranged accordingly. All specimens to be marked with formation and locality.—E. O. Meyers, Richmond House, Hounslow, W.

Ammonites—planorbis, Johnstonii, and angulatus, wanted from any locality.—H. E. Quilter, 77 Conduit Street, Leicester.

Lepidoptera.—Duplicates of cerella, lariciana, occultana (a few), tipuliformis, tiliæ, tambucata, *S. ligustri*, tiliaria, iota, phragmitidis. What offers?—George Balding, Ruby Street, Wisbech.

Fine specimens of ananchytes, micraster, galerites, and belemnites from the chalk, offered in exchange for other varieties of fossil or recent echini, British or foreign.—F. Stanley, M.C.S., 6 Clifton Gardens, Margate.

Wanted, Vol. v. of the "Entomologist's Monthly Magazine;" also Vol. v. of the first series of the "Transactions of the Entomological Society." State desiderata.—S. Barton, 114 St. Michael's Hill, Bristol.

Wanted, good foreign stamps. Will give books, micro-slides, or land and freshwater shells in exchange.—A. G. Alletsee, 1 South Villas, Kensington Road, Redland, Bristol.

Offered, several fossil shells, &c. (unnamed), taken from limestone quarry near here. Wanted, Science-Gossip or "Entomologist" previous to 1888.—S. A. Clair, care of Mrs. Hayward, Waterloo Road, Ironbridge.

Wanted, back vols. of Science-Gossip, works by Darwin, Spencer, Wallace, Bates, Lubbock, Huxley, and other scientific works. What offers for Huxley's "Biology," Morgan's "Biology," "Intellectual Observer," Wood's "Microscope and Moths."—H. Roberts, 60 Princess Road, Kilburn, London.

Offered, clutches of golden eagle, peregrine, chough, kestrel, s. hawk, dipper, stonechat, grasshopper wr., chiff-chaff, goldcrest, rock pipit, corn and reed buntings, twite, bullfinch, kingfisher, nightjar, rock dove, capercailzie, g. plover, oystercatcher, c. sandpiper, heron, spotted redshank, m. swan, cormorant, shag, black guillemot, h. gull, kittiwake, lesser tern. Eggs of eagle-owl, chough, pine grosbeak, dotterel, gannet, ringed and com. guillemots, razor-bill, sooty tern, fulmar, m. shearwater, s. petrel. Nests with small eggs. Describe clutches offered for the above.—R. J. Ussher, Cappagh, Lismore, Ireland.

Wanted, "The English Mechanic" for 1889, in exchange for Science-Gossip and "The Naturalists' Gazette" for the same year.—W. F. Kelsey, Maldon.

Micro-slides, well mounted, offered in exchange for Cassell's "Popular Natural History" (new edition), or other new natural history books.—W. Sim, Gourdas Fyvie, Aberdeenshire.

Artificial plants (Stein's), for demonstrating external morphology. What offers for Series I.?—G. A. G., 74 Market Place, Sheffield.

Lantern-slides, photo-micrographs, insect, botanical, diatoms, &c., offered in exchange for micro-slides. Wanted, golden eagle and buzzard, stuffed or skins, condition immaterial.—W. D. Stewart, 17 Upper Gilmore Place, Edinburgh.

Duplicates.—Good skins of guillemot, water-hen, puffin, yellow-hammer and stoat; also British moths, birds' eggs, land, freshwater, and marine shells. Desiderata.—British or foreign lepidoptera, birds' eggs, or shells.—W. Hewett, 3 Wilton Terrace, Fulford Road, York.

FOR disposal, a number of carboniferous, silurian, lias, and cretaceous fossils. Offers wanted.—J. A. Floyd, 5 Hospital Road, Bury St. Edmunds.

WANTED the January number for 1885 of SCIENCE-GOSSIP (241). Numbers 162, 180, and 200 for exchange.—Henry A. Francis, 14 York Place, Clifton, Bristol.

MOUNTED SLIDES.—Blood of newt and frog, stained, and diatoms from fuller's earth, hydra and melicerta ringens, living, offered for good mounted slides.—C. McWatters, 12 Springfield Place, Bath.

FOR exchange, "Harper's Monthly," January to December, 1889, good condition, unbound. Wanted, scientific books, magazines, or birds' eggs. Offers to—F. W. Paple, 62 Waterloo Street, Bolton.

FOR exchange, fossils from most formations. Wanted, fossils and rocks. Lists exchanged.—S. H. Reynolds, Southover, West Worthing.

OFFERED, a small collection of animal hairs, mounted in balsam, for same number of well-selected diatoms, mounted in like medium.—J. H. M., 10 Beaufort Square, Chepstow, Mon.

WILL exchange British and Belgian specimens of mosses, lichens, and hepaticæ, correctly named and localized, for natural history specimens, star-fish, echini or shells preferred, not necessarily British.—H. B. Preston, jun., 54 Lexham Gardens, Kensington, W.

OFFERED, SCIENCE-GOSSIP for 1888 and 1889, and Nos. 187–192, and 265; also many varieties of foreign shells. Wanted, stamps, coins, and the rare British shells.—Mrs. Heitland, The Priory, Shrewsbury.

WANTED, *Acme lineata*, *H. obvoluta*, *Limax gagates*, *L. flavus*, *L. lævus*, *Limnæa involuta*, *S. oblonga*, *S. virescens*, *V. angustior*, *V. lilljeborgi*, *V. moulinsiana*, *V. substriata*, *V. tumida*, *Hy. similis*. Offered, *H. fusca*, *T. haliobidea*, numerous shells, fossils, &c.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

THE "Band of Hope Review," containing first-class large engravings, stories, poems, and articles with religious and temperance teaching, &c.; would make a good volume, if bound together, of interesting reading. Eighty-one numbers, in fair condition. What offers?—T. E. Sclater, jun., Bank Street, Teignmouth.

WANTED, *Helix hortensis*, var. *incarnata*, in exchange for other land and freshwater shells.—John Radcliffe, 111 Oxford Street, Ashton-under-Lyne, Lancs.

WANTED, foreign shells, stamps, and conchological books, in exchange for choice micro-slides and British marine shells.—R. Suter, 5 Highweek Road, Tottenham.

WANTED, Ridgway's "Manual of North American Birds." Offered, books on English birds to value.—K., 1A Penn Road Villas, Holloway, N.

Ludlow, Llandeilo, and Wenlock fossils in exchange for fossils from all formations, and volcanic rocks. Lists exchanged.—W. H. Banks, Ridgebourne, Kington, Herefordshire.

OFFERED, polished granite chips, land, freshwater, and marine shells. Wanted, British fossils or minerals. Lists exchanged.—James Simpson, 51 Loch Street, Aberdeen.

WANTED, pathological micro-slides; will exchange books, &c.—Wood, 127 Bellevue Road, Leeds.

OFFERED, L. C., 8th ed.: about 100 species, including 40, 76c, 98, 121, 140, 254, 260, 335, 754, 829, 1088, 1237, 1255, 1385, 1474, 1592, 1595, 1694. Many desiderata in phænerogamiæ, musci, hepaticæ, and algæ. Lists exchanged.—Miss E. Armitage, Dadnor, Ross.

FINE specimens of *P. lineatus*, *V. cristata*, *N. fluviatilis*, var. *trifasciata*, and many others. Wanted, *H. pomatia*, *H. similis*, *H. lamellata*, and *H. pisana*, var. *alba*. Lists exchanged.—W. Thurgood, 36 Vyner Street, Haxby Road, York.

OFFERED, Rymer Jones' "General Structure of the Animal Kingdom," Taylor's "Collecting and Preserving Natural History Objects," Adams' "Our Feathered Families," Kirby and Spence's "Entomology." Wanted, "Origin of Species," "Voyage of the Beagle," White's "Microscopical Manipulation," &c.—F. Emsley, 98 West Street, Leeds.

WANTED, round and small size glass-top boxes: will give first-class exchange in either fossils, rare British marine shells, rare land and freshwater shells, some Cornish drift, very rich in rare shells, microscopic objects, and other organisms. Also offered, *Pyroxene andesite* (rare) from the interior of Mexico, which makes beautiful slides for the microscope, chips of rare Devonian (Madrepore) corals and sponges to work up for micro purposes. Wanted, *Mactra helvacea* and *A. lineata*. Correspondence invited.—Alfred J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

OFFERED, L. C., 8th ed.: 32, 138, 294, 500, 661, 662, 668, 712, 774, 954, 986, 1014, 1269, 1330, 1335, 1558, in exchange for others.—A. Sangster, Ivy Cottage, Cattie, Old Meldrum, N.B.

LAND and freshwater shells, also *Cypræa Europæa* for others. Send for lists.—H. B. Preston, jun., 54 Lexham Gardens, Kensington, W.

WANTED, last edition of Flower's "Osteology." State desiderata.—P. Tracy, Ipswich Museum.

DUPLICATES.—*Sph. lacustre*, *Sph. rivicola*, *V. piscinalis P. contecta*, *P. dilatatus*, *P. albus*, *P. glaber*, *L. Aruncatula*, *H. sericea*, *H. arbustorum*, *Z. glaber*, *C. Aridens*, *Car. minimum*, &c. Wanted, all varieties of *H. aspersa*.—F. C. Long, 8 Cog Lane, Burnley, Lancashire.

WANTED, to purchase a good reliable work on the British Gramineæ.—W. Biddiscombe, 60 St. James' Place, Plumstead, S.E.

OFFERED, live specimens of *Limnæa peregra*, *L. palustris* and *H. rufescens*. Also thirty foreign stamps, including Brazil, India, Cuba, Hongkong, Japan, Tasmania, Porto Rico, &c., all different. Wanted, land and freshwater shells or fossils.—A. Whitworth, 65 Talbot Street, Southport, Lancashire.

TONGUES of *Patella vulgata*, &c., offered in exchange for named zoophytes or micro-material.—A. Vigar, 77 High Street, Ramsgate.

WANTED, a clean cheap copy of the latest edition of Hooker's "British Flora," other books or cash in exchange.—W. A. Gain, Tuxford, Newark.

GOSSE'S, "Evenings at the Microscope," for pamphlets on foraminifera, zoophytes and polyzoa, or for same unmounted or foraminiferous material (localized).—Smith, 134 Wilderspore Road, Warrington.

WANTED, *Clausilia laminata-rugosa*, *V. piscinalis*, *B. tentaculata*, *A. cygnacus*. Offered *Tellina bathica*, *L. rudis-obtusata*, *P. vulgata*, *N. catena*.—W. Jones, junr., 27 Mayton Street, Holloway.

WANTED, collection of igneous rocks for crystals of galena and other minerals.—G. H., 8 Tothill Street, S.W.

WANTED, fossils from Cambrian, Old Red, or Devonian. I will give a liberal exchange in carboniferous fossils for one good specimen from any of the above.—P. J. Roberts, 4 Shepherd Street, Bacup.

VERMES.—Wanted, conodonts and other annelid fossils, also annelid micro mounts, &c. Good exchange given.—J. Hornell, 105a Grove Street, Liverpool.

WILL exchange "British Mollusca," Jeffreys, the first 4 vols., 32 consecutive numbers "Journal of Conchology," Taylor, "Shell Collectors Handbook," Williams. 5s. ed., "Jonnston's Introduction to Conchology," for standard books upon the English lias or oolite formations.—A. Loydell, 20 Stanley Gardens, The Vale, Acton, W.

WANTED, "Entomologist" for 1881; also Nos. for July, Aug., and Sept., 1888; Sept., Oct., and Nov., 1887; Feb., 1886; and any vols previous to 1885. Also the "Entomological Magazine." Will give other books, insects, birds' eggs or skins, or shells in exchange.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

BOOKS, ETC., RECEIVED.

"Hampstead Hill: Its Structure, Materials and Sculpturing," by J. Logan Lobley, F.G.S. (London: Roper & Drowley).—"List of British Diptera," by G. H. Verrall, F.E.S. (London: Pratt & Co.).—"The Southern Skies," by R. A. Proctor (London: W. H. Allen & Co.).—"Illustrated Manual of British Birds," by Howard Saunders, Parts xviii., xix., and xx.—"Our Unappreciated Petroleum Empire," by Chas. Marvin.—"Index of British Plants," by R. Turnbull (London: Geo. Bell).—"Five Thousand Miles in a Sledge," by L. F. Gowing (London: Chatto & Windus).—"Foods for the Fat," by Dr. N. E. Davis (London: Chatto & Windus).—"Physiology of Bodily Exercise," by F. Lagrange, M.D. (London: Kegan Paul, Trench & Co.).—"Palestine," by Major C. R. Conder, D.C.L. &c. (London: Geo. Philip & Son).—"Occasional Thoughts of an Astronomer on Nature and Revelation," Rev. C. Pritchard, D.D., F.R.S. (London: John Murray).—"The Mollusca of the Great Yarmouth District," by J. B. Beckett.—"The Story of Chemistry," by H. W. Picton, B.Sc. (London: Wm. Ibister).—"Astronomy with an Opera Glass," by G. P. Serviss (London: W. Allen & Co., Caxton House, Paternoster Row.—"Journal of Conchology."—"Canadian Entomologist."—"Research."—"The Century Magazine."—"The Amateur Photographer."—"The Naturalist.—"The Botanical Gazette." — "Belgravia." — "The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes." — "The Microscope." — "Cassell's Technical Educator," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 10TH ULT. FROM: G. R.—G. B.—H. E. L.—S. B.—F. S.—A. J. B.—H. E.—E. O. M.—Miss P.—T. W.—B. D.—G. P.—W. W.—O. T. E.—W. H.—W. D. S.—J. A. F.—W. A. D.—G. S. G.—R. T. S.—J. P. N.—R. J. U.—R. J. A.—A. H. S.—H. B. B.—J. B. M.—H. F.—W. S.—T. D. W.—W. F. K.—H. R.—S. P. H.—J. M.—J. H. M.—R. B. P.—C. A. W.—R. J. P.—F. M. H.—H. A. F.—W. G.—J. W. S.—T. B. B.—W. L.—R. W. P.—A. C. S.—W. T.—A. W. H.—T. R. N.—M. A. B.—T. E. A. T.—J. T. H.—A. V.—H. W. L.—J. C. S.—W. J. S.—Mrs. H.—H. F.—J. Y.—W. A. G.—E. W.—A. W.—W. B.—E. V. P.—F. C. L.—J. R.—S. & H.—C. McW.—W. T.—J. E. W.—A. C. D.—F. W. P.—A. M.—J. S.—J. H. K.—J. A. W.—R. S.—C. A. W.—T. E. S.—A. J. R. S.—H. J. T.—J. H.—E. D. M.—S. A. B.—J. H. M.—F. W.—E. V. P.—F. E.—E. A.—S. H. R.—P. T.—J. B. B.—F. N.—A. L.—J. S.—A. G. T.—W. J. J.—G. H.—W. P. H.—S. L. M.—P. J. R.—D. B.—J. H.—W. H.—A. L.—&c., &c.

THE NEBULAR HYPOTHESIS.

No. 2.

By E. P. RIDLEY.

LET us proceed now to consider the cases of Uranus and Neptune. No trustworthy information has at present been obtained as to the axial inclination of Mercury. The inclination of Venus is also uncertain and is variously given from 55° to 75°. The inclination of the earth is $23\frac{1}{2}$°, of Mars $27\frac{1}{4}$°, of Jupiter 3°, of Saturn $28\frac{1}{2}$°. The satellites of Uranus travel in a plane nearly at right angles to the plane of the solar equator, in which the planet travels; and if these satellites are in the plane of the planet's equator, then the axis of Uranus lies very nearly in the plane of the solar equator. These satellites also travel in a retrograde direction, that is from east to west, and hence it is assumed that probably the planet revolves in the same direction. If the observations on Neptune's satellites can be trusted, they also revolve in a retrograde manner, and so probably the planet itself rotates in the same direction, but its axis is not so much inclined as in the case of Uranus. Mr. Spencer suggests an explanation of this retrograde motion by reference to the shape of the rings from which the outermost planets were formed. When the solar nebula was so large as to fill the orbit of Neptune, its rotation must have been slower, and its figure less oblate than at later stages of contraction. Now, the ring detached from a very oblate spheroid which bulges greatly at the equator must obviously be shaped like a flat quoit as is the case with Saturn's rings, while conversely the ring detached from a spheroid which bulges comparatively little at the equator will approximate to the shape of a hoop. Hence the rings which gave rise to Neptune and Uranus, having been detached before the solar nebula had attained the maximum of oblateness, are likely to have been hoop-shaped, and considering the enormous circumferences occupied by these rings, compared with the moderate sizes of the resulting planets, they must have been very thin hoops. Now, in such a hoop the angular velocities of the inner and outer surfaces respectively will be nearly equal, and the planetary mass into which such a hoop concentrates will have its greatest diameter at right angles, or nearly so, to the plane of its orbit, so that its tendency to rotate in the line of its revolution will be so slight as to be easily overcome by any one of a hundred possible disturbing circumstances. Besides, we certainly should expect the equator to form in the direction of the greatest diameter, whatever that direction might be. Without feeling required to point out the precise nature of such circumstances, it may readily be seen that, in the case of the outermost planets, the causes which ordinarily make the rotation coincide with the line of revolution were at their minimum of efficiency. So that the retrograde rotation of Uranus, though not perhaps actually implied by the hooped shape of its ancestral ring, is at any rate quite in accordance with it.

There is no regular gradation in the bulk of the planets; but John Fiske points out that if we consider the thickness of the genetic rings as determined by comparing the size of a planet with the size of its orbit, then from Neptune to Jupiter there was a regular increase in the thickness of the rings such as the theory would lead us to anticipate. The enormous mass of Jupiter seems to have exhausted the central mass, and the next ring which formed into the asteroids was again hoop-shaped and very thin, the thinnest of all; but from the asteroids to Mercury there is again a regular succession, from hoop-shaped to quoit-shaped, each new ring formed being thicker than its predecessor. The different systems of satellites offer a similar contrast; thus in the Jovian system there was a regular increase in the thickness of the genetic rings from the outermost to the innermost moon. The thickness of the genetic rings appears also to have determined the rate of rotation of each planet on its own axis; for, other things being equal, a genetic ring which is broadest in the direction of its plane will produce a mass rotating faster than one that is broadest at right angles to its plane. Accordingly we find that Jupiter and Saturn—which originated from relatively quoit-shaped rings, notwithstanding their enormous size—each rotate in about ten hours; while all the inner planets, originating from relatively hoop-shaped rings, rotate with much less rapidity. In considering the size of the planets it must not be forgotten that the solar mass was continually growing smaller and denser. This would further account for the great difference between the sizes of the outer and inner planets.

The gravitative force of Jupiter is more than twice that of all the other planets put together, so that the thinnest and weakest of all the rings which started comparatively close at hand, had very little chance of forming into one planet. The gravitative force of Jupiter is more than sufficient to have dragged the pieces of the ring as it broke up so far out of their normal path, that all hope of ultimate concentration was hopelessly gone; and accordingly, instead of one planet, this ring formed the Asteroids—a collection of planets.

The attraction of Jupiter, however, does not account for the great inclination of some of the asteroids to the elliptic, and this circumstance, as I have already said, at present remains inexplicable. A simple mechanical consideration will show that the detachment of a moon-forming ring from a contracting planet depends on the excess of centrifugal force over gravity at its equator, and it is therefore evident that rings will be detached in greatest numbers from those planets in which the centrifugal force bears the greatest ratio to gravitation. Such planets ought to have the greatest number of moons; and such is the case. Of the four inner planets, which rotate comparatively slowly, and in which the centrifugal force is therefore small, only the earth and probably Mars are known to have a satellite.* But Jupiter, whose centrifugal force is twenty times greater than that of any of the inner planets, has four satellites. Uranus, with still greater centrifugal force, has at least four, and probably more. And finally, Saturn, in which the centrifugal force is one-sixth of its gravity, being nearly fifty times greater than in the earth, has at least eight moons, besides three partly broken rings. Mr. Spencer declares that this emphatic agreement of observation with deduction is an unanswerable argument in favour of the nebular theory. He says, here where the dynamic relations involved are so simple that we have no difficulty in tracing them, the significance of the result is unmistakeable.

The Saturnian system is altogether exceptional and very fascinating, well worthy of a great deal more attention than there is time to give it in this article. Saturn, the least dense and second largest planet, weighs ninety-one times as much as the earth, but being light as cork, it is six hundred and ninety times the volume of the earth, and is nine times as great in circumference. It is encircled by two bright, quoit-shaped rings, together about 58,000 miles in width, and one dark inner ring under 18,000 miles in width. The thickness of the rings is uncertain, but probably from 200 to 300 miles. The rings probably consist of brickbats, or meteorites. This conclusion is the result of a series of calculations and observations too interesting to be passed over in silence. Every satellite is subject both to centrifugal and centripetal forces which tend to elongate the satellite to an egg-shape. This effect is well known in the case of our moon, which is drawn out and now rotates only once during its entire revolution round the earth, so that the same side of the moon's surface is always turned towards the earth. These opposing forces would drag a planet to pieces as soon as they became greater than the internal force of gravity which the satellite possesses and which keeps its particles together. Roche determined in 1848 that the greatest possible elongation of which a fluid body is capable without being broken up, is when the ratio between the longest and shortest diameter is 1000 to 469; also that the centre of such a satellite must be at least a distance from the planet's centre of 2·44 of the planet's radius. This distance is termed "Roche's limit." Now, the distance of the outside of Saturn's ring system from the planet is 2·38 times the mean radius, so that the rings are entirely within Roche's limit; hence Roche concluded that the ring is broken and consists of fragments, and that no planet can be formed in that position. In 1851 Bond concluded, from observation, that the ring consisted of fragments, and in 1857 Clerk Maxwell came to the same conclusion by calculation, and constructed a model, which is in the laboratory at Cambridge, to exhibit the movements of the pieces of the rings (which he described as a mass of brickbats), now crowding together in one place, now in another, making almost waves as the centre of the crowded parts moves along in the direction of rotation. Maxwell also showed that a spreading of the rings both

* Though it is now generally acknowledged that Mars has two very small moons, the writer considers that at present sufficient is not known of them to enable him specially to deal with them. The smaller and inner one appears to be just outside "Roche's limit," and the period of its revolution is less than one-third of the period of the rotation of its primary.

outward and inward was a theoretical result of the inevitable impacts between the parts of the rings, and it is certain that considerable visible changes have taken place in the rings since they were first observed in 1659. As to the future of the rings, Professor G. H. Darwin believes that the outward spreading will, in time, carry many of the brickbats beyond Roche's limit, where there will be no longer any obstacle to aggregation into a celestial body, and a ninth satellite will probably be formed. The inward spreading will, in time, carry the meteorites to the limits of Saturn's atmosphere, where, heated by friction as they rush through the air, they will be disintegrated and fall on to the planet as dust. After a time, the length of which no estimate can be formed, the rings will have vanished, leaving the ninth satellite as their descendant.

Saturn, which is only half as dense as Jupiter, is by far the least dense planet, and this may account for a ring having been formed so near to the planet and so late in the planet's separate existence; but look at the subject how we may, Saturn's rings are visible facts strongly favourable to the nebular theory.

Looking back for a moment, we have established the prior existence of the solar system as a nebulous mass. M. Plateau's experiment shows that rings and planets may be formed from such a mass, and in Saturn's system we see that a ring certainly has been formed.

The present physical condition of the various planets affords further corroborative testimony in favour of this theory. If all the planets have successively originated from the same vaporous mass, they must be composed in the main of similar chemical elements, and this inference has thus far been uniformly corroborated by spectroscopic observation wherever there has been an opportunity of employing it. Spectroscopic observation has, indeed, shown much more than this, namely, that the whole of the matter of the universe is composed mainly of the same physical matter as the solar system, so that any deductions which can be made from the stellar system may be safely used in discussing the solar system.

It is found that the density of the interior planets of our solar system, compared with that of the more remote, is about as five to one. The obvious conclusion is, that there is a preponderance of the metallic elements in the interior planets and of metalloids in the exterior. It is evident, as Mr. Lockyer has shown, that when our solar system existed in a nebulous condition, the metallic or denser elements would occupy the interior portion of the nebula, and the metalloids the exterior. Taking a section of this nebula from its centre to its circumference, the elements would, in the main, be found arranged according to their densities—the densest at the centre, and the least dense at the circumference. If we compare the planets with their satellites, we find the same law holding true. The satellites of Jupiter, for example, have a density of only about one-fifth of that of the planet, or about one twenty-fifth of that of our earth; showing that, when the planet was rotating as a nebulous mass, the more dense elements were in the central parts, and the less dense at the outer rim, where the satellites were being formed.

Again, if we take the case of our globe, we find, as Mr. Lockyer remarks, the same distribution of materials, proving that when the earth was in the nebulous state, the metallic elements chiefly occupied the central regions, and the metalloids those outer parts which now constitute the earth's crust.

All these facts show that the sifting and sorting of the chemical elements, according to their densities, must have taken place when our solar system was in the condition of a nebula. But, further, it seems impossible that this could have taken place had the materials composing the nebula been in the solid form, even supposing that they had taken the form of clouds of stones. This is dead against the meteoric theory of Mr. Proctor, which I shall refer to later.

In some of its stages, the nebula had a very much higher temperature than that now possessed by the sun. There must, during the sifting period, have been complete chemical dissociation, so as to keep the metals and the metalloids uncombined, and thus allow the elements to arrange themselves according to their densities. "The nebular hypothesis," remarks Mr. Lockyer, "is almost worthless unless we assume very high temperatures, because, unless you have heat enough to get perfect dissociation, you will not have that sorting out that always seems to follow the same law."

Before concluding, it will be shown why it is believed very high temperature actually did exist in the nebulous mass. In consequence of the sorting and loss of heat referred to, the earth's ring in starting was much denser and cooler than Saturn or Jupiter: being much smaller it would cool more quickly, so that while the earth has cooled into a planet with a solid crust, Saturn and Jupiter are still, to some extent, self-luminous. Herschel, Airy, and others have observed what appear to be vast upheavals of portions of the surface of Saturn—the so-called "square-shouldered" appearance of Saturn —showing that there is not yet a solid crust to that planet. Our moon starting from the earth with a density which must have been nearly equal to the density of the earth, but with a much smaller mass, has cooled still more rapidly. The volcanic remains on its surface evidence former heat. Professor Frankland has shown that, assuming the solid mass of the moon to contract in cooling at the same rate as granite, its refrigeration, though only 180° F., would create cellular space equal to nearly

14,500,000 of cubic miles—more than room for all the water and atmosphere which the moon could ever have had; and now water and atmosphere have disappeared from the surface of the moon and become sucked into the pores of the rocks.

(*To be continued.*)

IN THE NEW FOREST.

WHAT a splendid field for the study of practical natural history is afforded by the New Forest, Hampshire. My acquaintance with it is, I regret to say, very slight indeed; in fact, merely one day's ramble in the neighbourhood of Brockenhurst and Lyndhurst, but I saw quite enough to determine me to pay it a longer visit as soon as I can find time to do so. It was a windy, rather dull day, at the latter end of September, when I took my walk, so I did not see the forest at its best; but, even under those disadvantageous circumstances, it was very enjoyable. Flocks of linnets swarmed about the thistles, shaking off clouds of down as they settled. Chaffinches, in parties almost entirely composed of one sex, justifying their specific name (*cœlebs*), chirped merrily on all sides; peewits wheeled about overhead, and rooks were busily searching for food among the cattle. One black rascal hopped jauntily on to a cow's back and then on to one of its horns, as its placid bearer lay calmly meditating and chewing the cud.

I soon found my way to a brook, which ran across a heath: great "water-measurers" (*Gerris lacustris*) were running about in a jerky manner, on the surface of the water; and down in the holes under overhanging bushes, by peeping cautiously over, I could see trout lazily swimming to and fro. They seem to have a regular "beat," and to move slowly over the same ground, time after time. In the bushes around were large numbers of ox-eye titmice, coal titmice, and the graceful little long-tailed tits, and very pretty it was to see them hopping among the twigs, as often head downwards as upwards. As I was approaching the water again to look for a small trout I had seen rising, a sharp hiss at my feet drew my attention to an adder lying coiled up. I am sorry to say that I acted on my first impulse, and killed it with my stick. I think that the venomous properties of adders are much exaggerated, and, although there have been cases, I believe, of death following their "sting," vipers very seldom grow to a size, in England at least, which renders them dangerous to human beings. They are, besides, timid reptiles and, unless molested, invariably get out of one's way as quickly as they can. The one I killed measured only nineteen inches, and was beautifully marked.

Fig. 17.—Longtailed Tit (*Parus longicaudatus*).

I then jumped across the brook, and got into a fine plantation, principally of fir-trees, where I had the pleasure of seeing a tree creeper running on a branch, and soon afterwards had my attention attracted by a "tap-tap-tap"-ing to a green woodpecker. He looked very handsome indeed in the sunlight, as he flew away. Several magpies were flying about, and I also saw a jay—and heard him, too, as he disappeared screeching.

It came on to rain about midday, so I sat under a tree, watching some trout in the brook. Presently there was a loud, sharp squeak, and a flash of emerald green and red passed by, and settling on a stump, showed me a kingfisher. I kept quite still and watched him as he sat motionless, with his head on one side, looking at the water. I was in hopes that I should see him catch his dinner, but a fat little forest pony came trotting by and frightened the kingfisher away. As I still sat under the tree, two wild rabbits came flopping along, making a great noise as their hind legs struck against the dry bracken ; they stopped within ten yards of me, but suddenly grew suspicious and sat up on their tails, with their fore paws hanging down, and their long ears erect for a few seconds, then took to their heels. I walked on a little way and heard a pattering noise among the dead leaves on all sides ; for some time, I could not discover the cause, but at length, by creeping quietly up, saw some pheasants running about, looking for food.

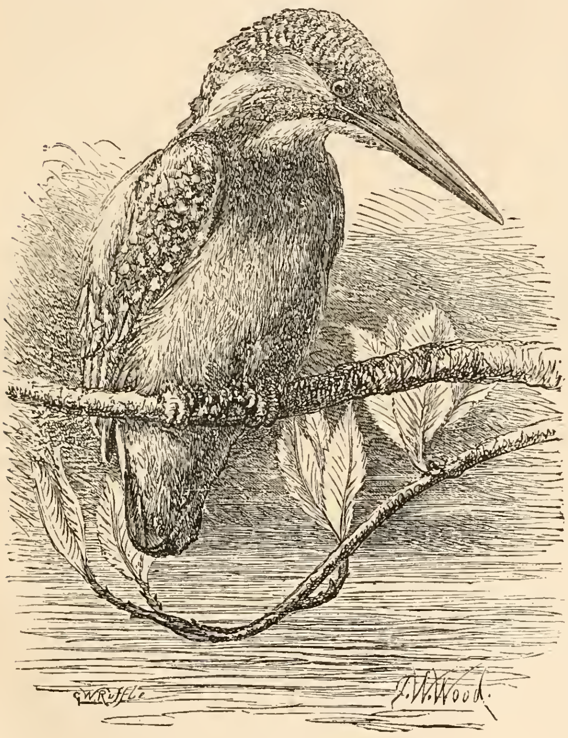


Fig. 18.—Kingfisher (*Alceao ispida*).

I am, unfortunately, only a beginner at botany, so cannot say anything about the flowers and plants I saw, except that they were lovely ; the district must be specially attractive to lovers of that delightful science.

The dusk came on all too quickly, and I was obliged to tear myself away, thoroughly enchanted with the forest, its scenery and inhabitants. I may add that, except on the high road, I did not see a human being all day.

H. J. W.

STUNG BY AN ADDER.

CONSIDERING how many "things with stings," with poisonous fangs and venomous properties, there are, even in this favoured England, the wonder is, not that so many, but so few, people are injured. Viper bites, for instance, though common, are not frequent ; and vipers, every one who is familiar with marshy moorland knows, are venomous enough.

There is a pretty little bit of Devonshire heath-land known as Little Haldon—charming at all seasons of the year, but perhaps looking its best now when the heather is all in flower, and the gorse coming into its second blossoming. On all sides the various autumn berries are ripening ; the kernels have swelled in the nuts. Alternate with the dry moor are coarse patches of marshy ground, where the cross-leaved heather is still in blossom, and brown grasses rise in great tussocks out of the bog-moss. Standing on the marsh the view is beautiful on every side : the neighbouring fields have sheaves of corn standing on them, and from below the jingle of a reaping-machine rings musically in the valley. Truly a delightful place, this bog, but the "snake in the grass" abounds here. Where the bracken or the grasses make a dry spot, there the vipers bask, well warmed in the sunshine, yet close to the water they like so much. You may nearly tread upon them, and hear them rustle away under foot ; or you can make them jump at a stick and fight with it, hissing all the while. "Long Cripples," the Devonshire people call them ; a name instantly suggesting Pope's "wounded snake," although there is nothing crippled in their swift, lithe movements.

Long familiarity with the vipers has made us quite indifferent to them during our moorland rambles. We have taken the dogs on the marsh times without number, and no harm has happened to them. But after ninety-nine times of safety, the fatal hundredth arrives—the dogs, after their wont, are careering over the marsh, startling a partridge here, chasing a rabbit there, when one of them, a small white Pomeranian, comes back to us shrieking, limping, evidently injured, though how or where it is hard to tell. Very soon one foot swells extremely, and he is so stiff that he can scarcely walk ; indeed, although an active little fellow, he is grateful at last to be carried home like a baby.

At first we hope that it is nothing worse than a bee sting, but presently it gets so bad that we send for the local dog man; he is not a "vet," but a time-honoured institution in the neighbourhood, and combines dog-doctoring with fishing.

One glance at the purplish inflammation on our pet's side suffices him.

"Little dear," he remarks (at the same time tightly holding the dog's nose lest it should bite), "he's been stung by an adder."

Then follows the advice to administer a big dose of castor-oil and buckthorn, and a few drops of hartshorn in water every few hours; the inflamed side is to be bathed with warm water; and our doctor does not doubt but that the dog will get quite well.

For our further consolation he describes a black retriever of his own, which was bitten in the face, and recovered perfectly, all but a swelling on the injured spot, and was remarkable ever after for killing every viper it saw.

Adder-bites are things over which doctors always disagree. Scientific magazines have perpetual discussions about them, and their fatality. Some enthusiasts are bold enough to let themselves be bitten, that the venomous nature of the bite may be proved; others regard recovery as a miraculous escape. The end of the argument leaves each writer of the same opinion still. Reason seems to suggest that in this, as in every case of blood-poisoning, the effect would depend very much upon constitution and temperament.

If it is difficult to extract any truth about the effect of adder-bites on humanity, still harder is it about animals; for the accounts are few and usually contradict each other, the universally received opinion being that dogs bitten never recover. They may linger for a year, says one story, but will die in convulsions, or pine away, at the end of it. In cases like this it may be taken for granted that no care has been given to the animal. Faith should never be put in the accounts given by farmers or labourers of the effect of adder-bites. Their fear of every snake amounts to superstitious terror. They never wait to decide whether the reptile is a viper, a ring-snake, or a slow-worm, but instantly retreat before it. If a dog is bitten they shoot it immediately, to "spare it further pain." We have been told that a viper's bite will make a sheep-dog swell up and die in an hour.

Accounts more cheerful and less exaggerated tend, however, to show that fairly careful nursing will soon do away with the evil consequences of the bite; leaving a propensity to kill vipers on the part of the bitten dog. This is very strange, extremely unlike the "once bit, twice shy" nature of most animals. An account in SCIENCE-GOSSIP relates that a dog who had recovered from an adder's bite perpetually hunted his enemies, killing them very cleverly by an attack from behind that broke their backs before they were aware of his presence. The retriever before mentioned was described as "dead on adders." Is it the result of a sense of self-preservation in the canine brain? The injury to our dog is not the first experience of an adder's bite in our family. Many years ago one of us, when a child, was bitten on the same moor. This was in April, when the vipers are not so virulent as in July and August. The wound was very carefully sucked and cauterized by the family doctor, who dosed his patient with ammonia and brandy. After being for some days the medical lion of the neighbourhood, the bad effect entirely disappeared, though a prick on the nerve of the injured finger serves, to the present day, as a reminder of the adventure.

Undoubtedly an adder's bite is sufficiently serious, either to a human being or an animal, to require careful attention, given as soon as possible; and during dog-doctoring care should be taken that the animal does not bite, as this might result in a nasty blood-poisoned wound. After a few days our own canine patient recovered spirits and appetite, the stiffness relaxed, and the dog was himself again.

Sometimes it is said that valuable sporting dogs are fatally injured by adder-bites. Is this because the injury is not taken in time, or that the owners immediately destroyed the animal, under the impression that there was no chance of recovery? After the difficulty we have experienced in finding out any particulars about dogs bitten by vipers, or any cures for them, we think that other lovers of dogs, whose pets have, in local parlance, been "stung by adders," will be glad to know that the evil is curable, and that there is no reason to ensure its fatality with a bullet.

BEATRIX F. CRESSWELL.

August, 1889.

NATURAL HISTORY NOTES FROM NEW ZEALAND.

R. N. H. writes (Kohimarama, Auckland, N.Z., 19th May, 1889):—I am glad to learn that you are still taking interest in the Selborne Society, for I should say it is likely to do a great deal of good, if only in drawing attention to the worse than useless slaughter of poor birds for their plumage—an abominable thing.

Boys do not seem to go "bird's-nesting" here; I rather wish they would, as many of the imported birds increase too fast altogether, and become a perfect nuisance. For instance, I sowed some grass seed on our little paddock in front of the house yesterday afternoon; and early this morning, and late too, larks in numbers were busy picking it up (English skylarks). And as I bought the seed and had to employ a man and horses to harrow it in, that means a loss to me of money, seed, time, labour, and grass, and I wish that we had never seen or heard a skylark here. When all those birds were imported, their natural enemies, such as sparrow-hawks, owls, bird's-nesting boys, ought to have been brought out and turned out with them.

As it is, we are suffering from upsetting the balance of Nature, a thing that cannot be done with impunity, as the Australian squatters found out when they poisoned the dingoes and eagle-hawks to save their sheep, and then, through the immense increase of kangaroo and wallabi, had their flocks nearly starved for want of grass.

I have only been out shooting once this season, when I got a hare. Game is so scarce hereabout, with the exception of rabbits, that it is not worth while taking a gun out; and there is so much cover (manuka scrub) that the rabbits are hard to get at.

THE BEST HUNDRED BOOKS ON NATURAL HISTORY.

THE idea has occurred to me that a very large number of people who are interested in natural history, either as a whole or in some branch, would like to purchase a few of the best books bearing on the subject for reference and study, but are utterly overwhelmed by the large number of works between which they have to choose. It is to assist such that the following list has been drawn up.

The books chosen are, for the most part, those which have been praised by persons most capable of judging their value. Where books on special branches of the subject are quoted, they are, as far as possible, such as would interest any worker in natural science, even though the subject were not his speciality. In some instances option has been left between two books of different states of advancement.

In order to keep down the expense, the illustrated books of reference relate only to British species.

Any proposed alterations should be sent to K. Roberts, 60 Princess Road, Kilburn, London, and will be taken into consideration for an amended list.

Classical.

Aristotle's "History of Animals;" Pliny's "Natural History;" "Harvey on the Circulation of the Blood;" White's "Natural History of Selborne;" Humboldt's "Cosmos," and "Travels;" Chambers's "Natural History of Creation."

General Natural History, &c.

Wood's "Illustrated Natural History," and "Homes Without Hands;" Waterton's "Essays on Natural History," and "Wanderings in South America;" Buckland's "Curiosities of Natural History;" Darwin's "Naturalist's Voyage;" Bates' "Naturalist on the Amazon;" Belt's "Naturalist in Nicaragua;" Wallace's "Malay Archipelago," and "Travels on the Amazon."

Text Books.

Claus and Sedgwick's "Zoology;" Marshall and Hurst's "Practical Zoology;" Gray's or Quain's "Human Anatomy;" Holden's "Osteology;" Flower's "Comparative Osteology;" Foster's, Kirke's, or Huxley's "Physiology;" Balfour's "Embryology;" Tylor's "Anthropology;" Lyell's "Principles, or Elements of Geology," or Geikie's "Text Book;" Sachs', or Prantl and Vines' "Text Book of Botany;" Bower and Vines' "Practical Botany."

Handbooks, and Books on Special Classes of Animals and Plants.

Browne's "Practical Taxidermy;" "Taylor on the Aquarium;" "Carpenter on the Microscope;" Hartman's "Anthropoid Apes;" Mivart's "Man and Apes;" Yarrell's "British Birds;" "Huxley on the Crayfish;" "Mivart on the Frog;" Lubbock's "Ants, Bees, and Wasps;" Romanes' "Jelly Fish, Star-Fish, and Sea-Urchins;" Kirby and Spence's "Introduction to Entomology;" Kirby's "Text-Book of Entomology;" Van Beneden's "Animal Parasites and Messmates;" Hooker's "Flora of the British Isles;" Cook's "Fungi;" Miller's "Old Red Sandstone."

Books on Prehistoric Times.

Lubbock's "Prehistoric Times," and "Origin of Civilization;" J. Geikie's "Prehistoric Europe," and "Great Ice Age;" Lyell's "Antiquity of Man;" Boyd Dawkins on "Early Man in Britain;" Tylor's "Early History of Mankind," and "Primitive Culture."

Works on Function, Origin of Species, &c.

Darwin's "Origin of Species," "Descent of Man," "Variations of Animals and Plants under Domestication," "Vegetable Mould and Earthworms," "Expression of the Emotions in Man and Animals," "Different Forms of Flowers on Plants of the same Species," "Fertilization of Orchids," "Insectivorous Plants," "Movements of Climbing Plants," "Power of Movement in Plants," "Effects of Cross and Self Fertilization in the Vegetable Kingdom," "Coral Reefs," "Volcanic Islands;" Fritz Muller's "Facts and Arguments for Darwin;" Lubbock's "Origin and Metamorphoses of Insects," "British Wild Flowers in relation to Insects," "On Flowers, Fruits, and Leaves;" Grant Allen's "Colour of Flowers;" Hermann Muller's "Fertilization of Flowers;" Ray Lankester, "On Degeneration;" Schmidt's "Descent and Darwinism;" Hankel's "History of Creation," "Evolution of Man;"

Spencer's "Principles of Biology;" Semper's "External Conditions of Existence as they affect Animal Life;" Wallace's "Darwinism," "Contributions to the Theory of Natural Selection," "Island Life;" Weisman's "Studies in Descent," "Essays on Heredity;" Lubbock's "Senses of Animals;" Romanes' "Mental Evolution," "Animal Intelligence;" Argyle's "Reign of Law;" Huxley's "Place of Man in Nature."

ATLASES AND BOOKS WITH COLOURED PLATES.

Sowerby's "English Botany;" Wilson's "Bryologia Britannica;" Cooke's "Handbook of British Fungi;" Croall's "Nature Printed British Seaweeds;" Morris' "History of British Birds," "Nests and Eggs of British Birds," "British Butterflies," "British Moths;" Couch's "History of the Fishes of the British Isles."

BIOGRAPHY.

"Life of Charles Darwin," by his son, or by Grant Allen or Bettany; "Life of Robert Dick," "Life of Thomas Edward," by Smiles; "English Men of Science," by F. Galton.

H. ROBERTS.

JOTTINGS CONCERNING CERTAIN FRUIT TREES.

By MARY B. MORRIS.

PART V.—THE PEACH TREE.

THIS now much-prized denizen of our gardens and orchard houses, whose botanical name, *Amygdalus Persica*, at once reminds us of the fact that it is closely allied to the almond tree and points to its geographical origin, is reputed to have been brought from the East, by Alexander the Great, about the year 325 B.C., or perhaps as early as the Retreat of the Ten Thousand, 401 B.C., a supposition which is confirmed by the fact that the learned Theophrastus knew the tree and wrote of it as "Persica."

It appears to have been somewhat later in reaching Italy, for we do not read of it as known to the Romans until about the time of the Christian era. If it were unknown in the West until the period named, it had, nevertheless, found its way very much earlier to the far East, where, in fact, it dates back to a very remote antiquity. Proofs of this are met with in the mention made of the tree in the books of Confucius in the fifth century B.C., and, in a still more ancient Chinese work of the tenth century B.C., it is spoken of as well known and much esteemed there at a period at least 2000 years before its introduction into Europe; the writer referred to almost regarded it as an indigenous production. From China (or the West, as they express it) the Japanese state that they received it amongst the earliest imported orchard trees. The fact of its having been thus early distributed to the east of its native habitat, Persia, makes its comparatively recent introduction into India appear rather singular, a circumstance the proof of which is evident in the fact that there is neither any Sanscrit nor native Indian name for the tree, it being known either under its Persian or Arabic designation. There are many varieties grown in the northern parts of India, but it is only by dint of great care in the cultivation that it can be made to thrive in the N.E. of India. The early cultivators of this fruit tree seem to have been acquainted with many species, and there were almost as many superstitions and legends attaching to the fruit as there were kinds in cultivation. Thus, one variety which grew to a long point, and was of a brilliant red on one side, was regarded as the symbol of long life, and hence was introduced extensively into all personal ornaments, as well as into paintings and sculpture, and, above all, into presents made on occasions of congratulation. Another kind was supposed to have the power of preventing death, but, should it be found impossible to eat the fruit in time to procure the desired immunity, it was believed that at least it would preserve the body from corruption to the end of the world. The peach, too, was one of the fruits of immortality which were supposed to be cradled with those emperors who pretended to this climax.

Whatever may have been the value set on the peach by ancient superstition, we find from Pliny that, as a marketable production, they fetched a high price in his time, especially such kinds as were considered choice. He writes thus on the subject: "They ripen at the end of autumn, though some of the early kinds are ripe in summer; it is only within the last thirty years that these last have been introduced; originally, they were sold at the price of a denarius apiece . . . . This is a very harmless fruit and a great favourite with invalids; some, in fact, have sold before this as high as thirty sesterces apiece, a price that has never been exceeded by any other fruit. This, too, is the more to be wondered at, as there is none that is a worse keeper, for when once it is plucked, the longest time it will keep is a couple of days; and so, sold it must be, fetch what it may." Our author considered the peach a very wholesome fruit, "much more wholesome than plums; indeed," says he, "what known fruit is more wholesome as an aliment than this?" He distinguishes between the varieties by giving the palm to what he calls the "duraceous," referring, it is supposed, to the hardness of the flesh, or, as is generally thought, to the nectarine, which is usually regarded as only a sport from the peach.

Gerarde, in his Herbal, speaks of it as a kind of peach "which some call Nucipersica or Nectorins." His description of it is this: "The fruit or peaches be round and of a red colour on the outside, the meat likewise about the stone is of a gallant red colour. These kinds of peaches are very like to wine in flavour, and therefore marvellous pleasant." Observation shows that the nectarine is never found wild, nor does it naturalize itself beyond our gardens. It is less hardy than the peach, and bears all the appearance of being an artificial tree which we may look upon as a weakened form of the peach.

Few medicinal virtues seem to be accorded to the tree or its fruit. Pliny, who found remedies in most of the plants he describes, recommends the leaves beaten up, to be applied topically to arrest hæmorrhage: the kernels, mixed with oil and vinegar, to be used as a liniment for the cure of headache—a cure which some commentators on his writings attribute to the hydrocyanic acid contained in the kernels.

Gerarde gives nearly the same recipe as good for "restoring and bringing again the hair" that is fallen off. "The gum," says he, "serveth in a looch or licking medicine for those that be troubled with a cough."

In the present day we recognize no medicinal virtues in peach or nectarine, making use only of the delicious fruit and of the kernel, which distilled forms the foundation of the liqueur known as Noyeau.

A SHORT AFTERNOON'S CONCHOLOGICAL WORK IN WINTER IN NORTH STAFFORDSHIRE.

THE frost had only been gone a few days and the thermometer was rising and varying from 38° to 40°, when my friend Mr. T. F. Burrows, an enthusiastic conchologist, proposed to me on the 18th December last, that he should take me the next day to see if we could find specimens of that local and by no means common mollusc, *Helix fusca*, which he had been able to add to our list of North Staffordshire Mollusca a few weeks before, having discovered it on the edge of the mountain limestone district about five miles away. This shell is included in the list contained in Garner's "Natural History of Staffordshire," but had not been met with in recent years. I jumped at my friend's suggestion and was only too glad to think that I should at last probably be able to find this little mollusc in its native home, after searching for it in vain during the last five or six years. Off we started, soon after noon the next day; being rather later than we expected, and also remembering that we were close upon the shortest day, we hurriedly prepared our collecting bottles, and not forgetting light refreshment in our pockets, we arrived at our happy hunting-ground about two o'clock. Partaking of our frugal meal as we went along, our first halt was made at an old disused limestone quarry, which brought back to our recollection many former happy visits a few years ago when we had here collected specimens of *Bulimus obscurus* var. *alba*. More beautiful shells than these I have never seen, and I am afraid the little series in my collection has often excited envy in brother conchologists. I can only regret that the variety is not sufficiently plentiful here to supply other cabinets. We did not stay long at this spot, only observing that *Helix caperata* and *H. rupestris* were both abroad in some numbers, and this augured well for our finding *fusca* also out. I must not however omit to mention that my friend, on turning over a piece of limestone, disturbed a lively little field vole (*Arvicola agrestis*), and both of us being enthusiastic naturalists, we hurriedly boxed the little animal in a bed of leaves for future examination, hoping he might turn out to be *A. glareolus*, which is found in this district, and of which a brother naturalist was in want of a specimen; it however turned out to be *A. agrestis*, after all. Proceeding on our way we next came across a decaying log which looked too promising to pass by; the woodpeckers had been busily at work upon it, and guided by the holes they had made we dug deeper into the rotten wood and soon discovered a small colony of the curiously shaped rhinoceros beetle (*Sinodendren cylindricum*) hibernating in the log, which we bottled for a coleopterous friend. Whilst searching further in the decayed wood we came across *Helix rotundata* in some abundance, which had retired beneath the bark to lay their eggs, as is the habit with these molluscs; glancing at these little snails as they came into view, one caught my eye which for a moment puzzled me—a dark slatey-grey in colour and without the usual reddish spots. On taking it up I at once saw that I had got a prize and that it was var. *albida;* this makes the second specimen of this variety that I have taken in this neighbourhood. We now hurried on to the *fusca* locality, as not much daylight remained; a small spinney on the shady side of a little valley between the hills was our destination. The ground was very damp and covered with decaying nettle-stalks, under which grew the red campion (*Lychnis dioica*) upon the leaves of which my friend had first found *Helix fusca*, and this appears to be its food-plant here. Gwyn Jeffreys, in his "British Conchology," mentions that this mollusc feeds upon the leaves of the alder. Amongst other reasons that I have for thinking that the campion is its general food-plant, is the strong resemblance of this mollusc to a decaying capsule or seed case of the campion: the thin shell of this snail is the exact colour of the capsule when wet—a transparent horn colour, and the bottom of the capsule, which is a light yellow, exactly resembles one portion of the viscera of *H. fusca* as seen through its shell; in fact, so close did we find the mimicry, that we mistook these capsules in several instances for these shells at first sight. But I must return to our search: on arriving at the exact spot, down on our knees was the order of the day, and turning over the campion leaves the first cry of success came from my friend—one specimen. I then found two, next one more to each of us, after that a long futile search of half an hour; but when the darkness compelled us to stop the search we had each found five specimens. We were both satisfied with the result, considering the time of year, although my friend had been far more successful a few weeks before; but now a frost of several days' duration had intervened, and no doubt sent most of these snails into winter-quarters. During our search we found *Vitrina pellucida* very abundant, also *Cochlichopa tridens* (one specimen), *Helix arbustorum* var. *flavescens*, *Clausilia rugosa* and *Cl. laminata*, *Carychium minimum*, and many of the common *Zonites*, which altogether made up a good bag, and shows that a conchological ramble, even within a week of Christmas-day, is not altogether unproductive. Since writing the above, and on the 26th December last, my friend and I were again tempted by the mildness of the weather to pay another visit to our *fusca* ground, and were far more successful than on the former occasion, taking about twenty specimens each of this little *Helix*, which we found crawling about the campion leaves and deadnettle-stalks, and in many instances a foot or more above the ground, showing the hardiness of the mollusc. On this occasion we also took the following in addition to what I have mentioned before:—*Balia perversa*, *Bulimus obscurus* var. *alba* (one specimen), *Helix concinna* var. *albida* (three specimens), *Helix pulchella*, *Pupa umbilicata*, *Vertigo edentula*, besides numerous *Zonites* and the commoner *Helices*, *Limax arborum*, &c.

JOHN R. B. MASEFIELD.

Rosehill, Cheadle, Staffordshire.

SOME NEW AND LITTLE-KNOWN ROTIFERS.

By W. BARNETT BURN, M.D.

No. 6.—FURCULARIA TENUISETA (Fig. 22).

CHARACTERS.—Body cylindrical, front round; head separated by a strong constriction; eye wanting; toes very long, thin and flexible.

This is a large rotifer, being one fortieth of an inch long, of which nearly half is taken up by the long flexible toes, which apparently are of little use to the animal, dragging after it in swimming like threads, sometimes one twisting round the other. They seem only brought into activity when they are widely separated, almost at right angles to the body; they then become stiff, and catch against small particles, and acting as a break, stop the animal suddenly. The body is very transparent, it has a loose glassy integument extremely flexible. Under the head there is a clear space with only the œsophagus and lateral canals running through it, recalling the similar arrangement in *Copeus caudatus;* at this part the body is being continually bent about, backward, forward and sideways.

Although so delicate in appearance, it burrows through dense flocculent masses with ease, being like a little mole in this respect. No sooner than it has made a way through one portion than it goes to work on another, not so much with the object of finding food, as for the purpose of hiding itself in dark places.

This species clearly belongs to the family of the Notommatadæ. Like many others, it does not fall readily into any of the genera. The resemblance to *Copeus caudatus* has been mentioned, but it has no affinity with the genus. In its large size, hyaline transparency, and probable want of auricles, it

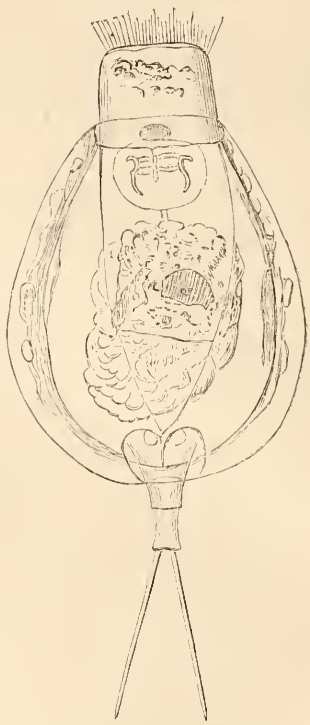


Fig. 19.—*Diplois propatula.*

approaches *Notommata theodora;* the absence of the eye and opaque brain masses precludes admission into that group. In bulk it may be compared with the larger Diglennæ, but the lack of eyes and the form of the trophi prevent its being considered one. It has a considerable likeness to *Furcularia cæca* in its outline and in the fold beneath the head; they are also companions in misfortune in being blind; it also in some points resembles *Furcularia eoa.*

This rotifer was found in water from a pool on Tooting Common that had been collected some days. Two were brought up with the dipping tube at once to begin with, then about forty dips were made before another was captured; six or seven others were brought under observation, by the exercise of perseverance during the three or four following days; they then died out, and on going to obtain more from the pool, it was found frozen over, and I was told by the Common keeper that it was against the rules to break the ice. I shall be glad to hear if any of your readers have found a rotifer like this, or any described in Dr. Hudson's work as very rare, my opinion being that the greater part are widely distributed, and may be found if looked for.

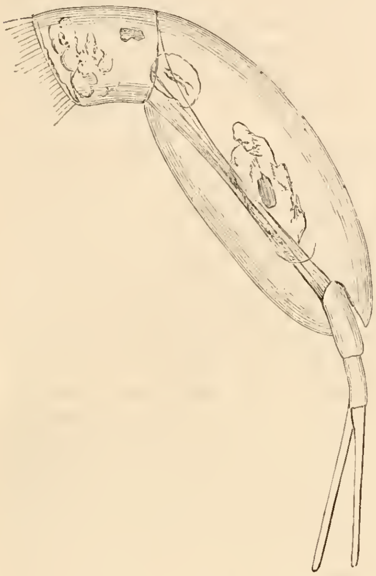


Fig. 20.—*Diplois propatula* (side view).

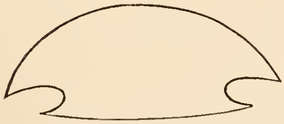


Fig. 21.—Fold of the lateral plate of *Diplois propatula*.

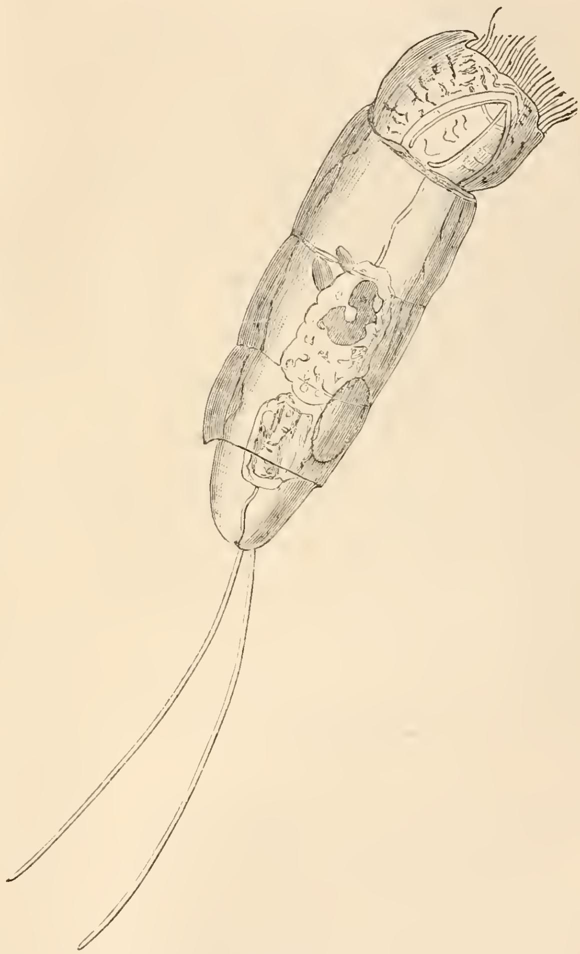


Fig. 22.—*Furcularia tenuiseta.*

No. 7.—Diplois propatula.

On the 29th of November Mr. Western kindly conducted me to a pool on Esher Common where he had taken many rare rotifers, among others *Diplois propatula*, which previously had only been found in one pool at Sandhurst, Berks. We found the ice an inch thick on the pools; but these not being under the ægis of the London County Council, we forthwith broke into them, and together secured over thirty species. To my lot fell this little-known rotifer (Fig. 19) in some quantity. Mr. Gosse s figure of this rotifer is as usual admirable, but in making out the three spines said to be attached to the lower plate, I found they were between the plates: then in the side view (Fig. 20), there was a notch which allowed the foot to be lashed about from side to side, which is a characteristic movement of the animal; sometimes the foot and toes are quite turned into the lateral sulcus. In this family the plates of the lorica are so transparent that it is difficult to say in what plane they are situated, but according to my observation the dorsal plate is arched considerably but is not open in front, the ventral plate is not flat but slightly curved, and it has no spines at the end; the infolded connection between the two plates ends at the posterior end in a notch, the external margin of which joins the dorsal plate, and the internal margin is attached to the ventral, forming, with the internal margin of the notch on the opposite side, the appearance of the central spine, the external margins forming the other two. The internal curved line is the fold of the lateral plate (Fig. 21), forming the opening between the two cavities, not being an opening in the dorsal plate. If this view be correct, it would make this rotifer a Euchlanis. Internally a chain of glands extends along the course of the lateral canals.

NOTE ON *Philodina tuberculata.*—Since writing the description of this rotifer, the supplement to Dr. Hudson's work has appeared, and in this he refers this species to *P. macrostyla*, certainly a more appropriate name, Mr. Gosse himself in a note on this species having stated that there were no tubercles on it. Dr. Hudson also describes four toes. I confess I have never seen a central toe like the one engraved in the November part of SCIENCE-GOSSIP. I must have put it in as seen in my mind's eye, being evolved from Mr. Gosse's dictum that "all the known British species (of the Bdelloida) have three toes." In Mr. Gosse's figure of *Philodina roseola*, there is also an appearance of four toes. I am looking out for this rotifer to clear up the point. I suggested the appearance of four toes was due to the sucker spreading out laterally, as the two outside toes in *Philodina tuberculata* vary in size, sometimes being large, at other times almost disappearing; when the toes are stretched out to their utmost extent, four toes are distinctly visible, and no alteration of focus will show the toe in the background, that I believed in. The toe itself is a small matter; its importance is that it spoils the classification, and forms an exception to an order. Nevertheless, facts are stubborn things; and if the four toes are there, we must accept them.

Beechwood, Upper Tooting.

NOTES ON THE NATURAL HISTORY OF QUEENSLAND.

No. 2.

IN the first portion of my son's Queensland observations a few points were accidentally omitted.

Thus the so-called "kite" is a recent introduction in Queensland, probably from the south of Asia. Old stockmen and shepherds remember that it was formerly unknown, though they cannot fix the precise date of its appearance. In South Australia and Victoria it is still very rare, or altogether wanting.

The fact that the wild cockatoos, when plundering a cornfield, post sentinels to give an alarm, is no longer questioned. But it is curious that if one bird is shot, the others, instead of at once taking flight, hover screaming over their dead companion until many of them share his fate.

The so-called "laughing jackass" is not, as many people think, merely the low comedian of bird-life; he is exceedingly useful as a destroyer of death-snakes, almost equal to the secretary-hawk of South Africa. His mode of warfare is peculiar; he seizes the snake by the neck and soars straight up into the air to a considerable height. He then lets his enemy fall, and instantly returning to earth, seizes him again, and repeats this manœuvre until the serpent is too much injured to offer any further resistance. A few pecks on the head ensure his death, when, of course, he is duly eaten. The utility of the laughing jackass is so fully known that the legislature of Queensland has imposed a penalty of £10 on killing one of these useful birds.

The bower-birds are not rare. When, as it sometimes happens, a community of eight or ten live together, the "bower" is very large and highly ornamented. Sometimes a number of shells are laid at regular intervals, either in a straight or a serpentine line.

The eggs of the emu are generally described as being dark green, but they vary considerably, some being almost black and some of a greenish grey.

The king-fishers are numerous and beautiful, but their diet seems to consist more of small lizards than of fish. Indeed, the rivers of Queensland are generally so turbid, that a king-fisher, sitting on an overhanging tree, will have little chance of espying a fish until it actually rises to the surface.

The mammalia of Queensland present little upon which anything can be here remarked. Sometimes there occurs, as in all the colonies, an invasion of rats, which seem to come from the desert tracts in the far interior and which do great damage. What they subsist upon in the deserts, and what leads them at times to a general exodus, are points which remain to be ascertained.

The marsupials of Queensland are substantially the same as those of the rest of Australia.

The reptiles, on the other hand, are numerous and important. Crocodiles, erroneously called alligators by the settlers, are met with in the larger streams and pools, and reach the length of sixteen to eighteen feet. Hence caution is needed in fording or bathing, especially when the water is very muddy. In the extreme north, crocodiles are said to be met with exceeding thirty feet in length.

The mysterious *bunyip*, said of the "black-fellows" to haunt the interior lakes of Australia, is still an unsolved problem. The descriptions given by alleged eye-witnesses negative the possibility of its being a crocodile. Perhaps the most reasonable supposition is that it is a seal. Several years ago a paragraph went the round of the papers, English as well as Colonial, that a monstrous saurian, resembling some of the extinct species, had been killed in a Queensland river, after a combat in which two black-fellows had been killed. The specimen, it was said, was on its way to London; but as it has not yet arrived, the whole story was probably an invention.

The iguana reaches the length of four feet or even four feet six inches, and though it never molests man, is, if attacked, to be dealt with cautiously. Its sharp teeth form two serrated rows, and inflict gashes like the cut of a saw. This lizard is a great enemy to birds; it ascends trees, regardless of the screams and flappings of the birds, thrusts its snout into any nests it may find and devours the eggs or the young. Hence, notwithstanding the absence of cats, monkeys, weasels, etc., the birds of Australia have their share of troubles.

It is to be hoped that no one, with the intent of waging war against the rabbits, will introduce weasels or the smaller felines into Australia. The mungus, which does not climb trees, will be a much safer ally both against rabbits, rats, snakes, and centipedes, of which later anon.

The iguana may sometimes be seen clinging to the trunk of a tree, or hanging from a branch, and in such attitudes has such a bark-like appearance as often to pass unnoticed. A newcomer in Queensland, seizing hold of one of these lizards, had his thumb nearly taken off by its saw-like teeth. A valuable sheep-dog, which had been muzzled lest he should swallow some of the poisoned baits laid for the dingos, foolishly disturbed an iguana, and though rescued by his master, had been very severely injured.

The iguana sometimes gets in collision with venomous serpents and mostly comes off victorious. The common opinion is that he possesses no immunity against snake-bite, but that he knows of some herb which is an antidote.

Many attempts have been made to find this plant, and rewards have been offered for its discovery, but in vain. Scepticism is here justified by the fact that the same rumour was formerly current concerning the mungus, which is now found to owe its success in serpent-killing merely to its own agility.

The chief poisonous serpents found in Queensland are the death-adder (*Acanthophis tortor*), which is fortunately rare. The "brown snake" reaches the length of nine or ten feet, and lives chiefly in holes or chinks in the ground. Hence it is very dangerous in a country where so many of the settlers live under canvas without any flooring. A family removing from New South Wales into Queensland, were delayed by the floods which set in on the breaking up of the long drought in March last. They encamped near the bank of a river, and in the night one of their children was bitten by a snake and died in a few hours. The next night another child, being carelessly let sleep on the same extempore bed, was also bitten and died in the same manner. Then a search was made; a hole was found in the earth, and, on digging down, a "brown snake" was unearthed and promptly destroyed.

In "camping out" it is needful to examine any hole in the ground by pouring boiling water down, if procurable.

The whip-snake, grey in colour and not more than a foot in length, is also very venomous.

The "Mulga-snake," found only in the so-called "Mulga scrub," is greenish on the back and red underneath. It also is venomous.

The carpet-snake, which reaches the length of fifteen feet, is harmless; but it is sometimes confounded with the ferocious and deadly tiger-snake, as the general colouration and pattern of the two, if hastily seen among herbage and brushwood, are not very unlike.

The tiger-snake reaches the length of eight, or occasionally even ten feet. Contrary to the sweeping assertion of Waterton, it will go out of its way to take the offensive. If it hears a noise it erects its head to look round, and if it espies man or beast, it comes forward to the attack. A team-man told my son that on one occasion, when driving along a road, a tiger-snake advanced out of the bush to attack the horses. Fortunately he succeeded in killing the snake with his long whip. Australian horses are very much afraid of snakes, and generally shy or bolt if they see one on the road.

It is a remarkable fact that snakes very rarely molest the "black-fellows," whose bare feet and general habits might seem to lay them quite open to attack. Indeed, some old bushmen say that they never knew a "black-fellow" die of snake-bite.

Among amphibians, mention may be made of a rather small, green frog, familiarly known as "The Catholic," because it bears on its back the mark of a cross in yellow spots. This frog is one of the few living creatures which enjoy an immunity from the attacks of ants. It squats down in one of their crowded highways and gobbles up the ants as fast as they approach, until, in the words of Sam Weller, it "swells wisibly." Yet these insects do not, as they would in case of a spider, a lizard, or a man, fall *en masse* upon the enemy, but allow him to work his will. Here is an interesting problem to solve.

J. W. SLATER.

A DOUBLE SUNFLOWER.

THE so-called monstrosities in plants have assumed a new interest and meaning in the light of evolution. Perhaps there is no natural order of plants whose members have gone through so many floral changes in their past history as the Compositæ. The very fact that each flower-head represents a colony of flowerets or florets is indicative of a change which must have reduced a spike of small flowers by depression into a flower-head or capitulum. Even the British members of the Compositæ exist in nearly every possible stage of composite arrangement, from the unattractive flower-heads of the Cud-weed to the gorgeous infloresence of the Leopard's bane. Compare the dwarf and poverty-stricken groundsel with the magnificent heads of the sun-flower, the cud-weeds with the hawkweeds, the single stem dandelions and marigolds with the many-branched hawkweeds, each scape breaking into a corymb, so as to present the greatest floral effect. When we remember the marvellous varieties of inflorescence in this dominant order, we are prepared to accept any so-called freak or monstrosity as useful in throwing a side light to illustrate the processes by which these multitudinous variations have been brought about. A correspondent has sent us the accompanying illustration of a double sunflower. The extra flower-head has no stalk, but is practically sessile. Is this particular plant trying to become a hawkweed, and ambitious that its scape should bear two flowers instead of one? The hawkweeds may have, perhaps must have, passed through some such stage as is represented by this monstrosity before they became what they are now. At any rate we give the illustration with these few rambling comments upon it for what they are worth; and we shall be pleased at any time to receive from our readers any good sketches of floral freaks or monstrosities for publication.

Fig. 23.—Illustrations in Vegetable Teratology: Double Sunflower.

ASTRONOMY.

By John Browning, F.R.A.S.

THE death of the Rev. S. J. Perry, better known, perhaps, as Father Perry, of Stonyhurst, is greatly to be lamented. This excellent and valued observer died of dysentery in the Salut Islands, five days after observing the solar eclipse of December 22nd, 1889. For several years Father Perry had made regular observations of the solar prominences by the aid of a powerful spectroscope. Fortunately for us, Mr. Frank McClean, of Tunbridge Wells, is doing admirable work in this direction.

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for February.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
MERCURY ☿	5	6 36M	11 14M	3 52A
	12	6 12M	10 41M	3 10A
	19	6 4M	10 29M	2 54A
	26	6 1M	10 30M	2 59A
VENUS ♀	5	7 36M	0 3A	4 30A
	12	7 27M	0 10A	4 53A
	19	7 17M	0 17A	5 17A
	26	7 6M	0 23A	5 40A
MARS ♂	5	1 27M	6 6M	10 45M
	12	1 19M	5 52M	10 25M
	19	1 9M	5 38M	10 7M
	26	0 59M	5 23M	9 47M
JUPITER ♃	5	6 42M	10 50M	2 58A
	12	6 19M	10 29M	2 39A
	19	5 56M	10 8M	2 20A
	26	5 33M	9 47M	2 1A
SATURN ♄	5	6 3A	1 16M	8 25M
	12	5 33A	0 47M	7 57M
	19	5 2A	0 17M	7 28M
	26	4 30A	11 43A	7 0M

At the meeting of the Royal Astronomical Society held on January 10th, the Astronomer Royal announced that the observations of the solar eclipse were successful. Excellent photographs of the corona had been taken.

A paper by Mr. E. C. Barnard, of the Lick Observatory, was read on observations of the brightness of one of Jupiter's satellites, Iapetus, while passing through the shadows of crape ring and the bright ring. While passing through the shadow of the ball the satellite was invisible. On emerging from the shadow of the ball it attained its full brightness in a few seconds, and continued equally bright until it entered the shadow of the inner edge of the crape ring. The brightness then decreased gradually with great regularity until it entered the shadow of the inner edge of the crape ring, when it was again invisible. As it was passing through the shadow of the densest part of the crape ring, the brightness of the satellite was reduced to one-third. The observation, of course, proves that the increase in the density of the crape ring, from its inner to its outer edge, is very gradual.

A paper by Professor Holden was read, describing the photographic apparatus of the great Lick telescope. Among other contrivances, means are provided for producing an enlarged image beyond the eye-piece end. It is expected that enlarged photographs of the moon will be taken with this contrivance, which will greatly increase our knowledge of the planet.

On February 6th Venus will be at the greatest distance from the sun at 0 hrs. morn.

There will be no occultation of any star above the 4th magnitude, nor any eclipse or other celestial phenomena of popular interest during the month of February.

In February Mercury is a morning star, situated in Capricornus; stationary on the 10th at noon.

Venus is near to the sun, and enters Aquarius about the 15th.

Jupiter is a morning star in the early portion of the month only.

Saturn is almost stationary in Leo, in opposition to the sun, on the 19th at 4 hrs. morn.

SCIENCE-GOSSIP.

"THE WESLEY NATURALIST" has been amalgamated with the "Journal of Microscopy, and Natural Science." We shall greatly miss the interesting and unpretentious magazine, which has done so much credit to the able editorship of the Revs. Dallinger, Spiers, and Hilderic Friend.

"THE Journal of Microscopy" for January contains the following papers:—"The Cells of Mosses," Rev. W. H. Lett; "Solid-Hoofed Hogs," Mrs. Bodington; "Among the Sea-Urchins," Geo Swainson; "Sensibility," F. W. Sutcliffe; "Dips into my Aquarium," Rev. W. Spiers; "Some Recent Developments of the Doctrine of a Contagium Vivum," Dr. Shingleton Smith; "A Camera-Lucida for Nothing," J. W. Plaxton; "Autumn in the New Forest," G. C. Turner; "Aspect of the Heavens: January, February, and March 1890," A. Graham; "New Form of Mounting Clip," G. H. Bryan; "The Romance of Science," by Rev. Hilderic Friend, &c.

THE Royal Botanic Society, has arranged the following fêtes and exhibition for 1890. Spring Exhibitions of flowers, Wednesdays, March 26th and April 23rd. Summer Exhibitions of plants, flowers, and fruit, Wednesdays, May 14th and June 11th. Evening fête and exhibition, Wednesday, July 2nd. Botanical Lectures, Fridays, May 9th, 16th, 23rd, and 30th, June 6th, 13th. Promenades, Wednesdays in May, June, and July.

THE last number of "The Essex Naturalist" contains, amongst other matters, the following papers:—"Presidential Address," by E. A. Fitch; "Notes on the Geology of Maldon and the Blackwater Estuary," by T. V. Holmes; "Discovery of Celtic Urns at Colchester," by Henry Laver; "The late Col. Russell's Contributions to Photography," by Professor Meldola; "Notes on the Lepidoptera of Leigh and its neighbourhood," by Howard Vaughan; "On a Deep Channel of Drift, in the Valley of the Cam," by W. Whitaker; "The White-

Beaked Dolphin in the River Colne," by H. Laver; "Notes on the Geology of the District around Chelmsford, with a List of the Mollusca, from the Alluvium at Roxwell, Essex," by R. W. Christy; "Historical Notices of the Short-Tailed Field Vole and Short-Eared Owl in Essex," by E. A. Fitch; "On Some Recent Subsidences near Stifford, Essex," and "The Geology of South Essex," by T. V. Holmes; "Of Hawks and Hounds in Essex, in the Olden Time," by J. E. Harting; "Destruction of Ancient Monuments in Essex."

The last number of the "Transactions of the Chichester and West Sussex Natural History and Microscopical Society" contains, besides the usual report, list of members, &c., the following papers: "An Insect's Upas Tree," by A. Lloyd; "Finds of Some Rare Sussex Plants," by Rev. F. H. Arnold; "Insects in Amber," by A. Lloyd; "Vegetable Monstrosities," by Dr. Paxton; President's Address, by J. Anderson, jun.; "List of the Lepidoptera of Bognor," by A. Lloyd.

The January number of "The Journal of the Quekett Microscopical Club" contains the following papers—"On a Simple Tank Microscope," by C. Rousselet; "On Spurious Diffraction Images and a New Apochromatic Object Glass," by E. M. Nelson; "On a New Rotifer," by T. Spencer; "On Microscopical Drawing, and on a New Centring Substage," by E. M. Nelson; "On *Smynthurus Aquaticus*," by E. T. Brown; "On *Asplanchna Amphora*," by G. Western; "Some Thoughts on a Bubble," by H. Morland; "On a Substage Illuminator, and on a New Eye-Piece," by W. Goodwin.

We have received No. 22 of Mr. W. P. Collins' Scientific Catalogues, containing an excellent assortment of books on Microscopy (including Petrography) at very moderate prices.

Mr. Barr Ferree sends us his paper, reprinted from "The American Antiquarian," entitled "The Element of Terror in Primitive Art." Mr. Ferree evidently knows what he is writing about, and his paper will doubtless be much appreciated by students of ethnology.

A paper by Mr. J. D. Churchill, M.I.M.E., has been republished on "Marine Engine Governors, and the benefits derived from them," in which the author shows the danger of neglecting to fit marine engines with governors.

The trustees of the Missouri Botanical Garden, in accordance with the intention of its founder, propose to provide adequate theorctical and practical instruction for young men desirous of becoming gardeners. The idea is a good one, and we should like to see the same sort of thing carried out in England.

Professor Langley, the distinguished American scientist, announces that he has completed his long and careful observations on the temperature of the moon, made at the Alleghany Observatory. His conclusion is that the mean temperature of the sunlit surface of our satellite is much lower than has been hitherto supposed, and that it does not exceed the freezing point of water.

An important paper was read last week before the Paris Academy of Sciences by the distinguished palæontologist, Professor Gaudry. No geologist knows better what he is talking about. Hitherto, the chief of the "missing links" in the geological record have been those of the ape family. They have only turned up, we believe, in the later Miocene deposits of Pikermi in Greece. But at the meeting aforesaid, M. Gaudry exhibited a fossil simial skull, which has recently been discovered at Serrat d'en Vasques in France. Many other fossils have been discovered in the same place, which contains large numbers of the remains of vertebrate animals. It is just possible, therefore, that the remains of French fossil apes will ere long throw some light upon "The Descent of Man."

American geological survey memoirs on the Cretaceous strata of the south-west, and their relations to the underlying and overlying formations, prove that each represents an unbroken continuation of Cretaceous time. The fossils in these formations also indicate there has been no hitch in their continuity. In Texas the Cretaceous system presses into the Tertiary formation without a stratigraphical or palæontological break.

Insect-collectors in India and the tropics are employing the electric light very successfully for the capture of moths.

Parts vi. and vii. of the "Transactions of the Hertfordshire Natural History Society and Field Club" are to hand, and are as usual rich in meteorological papers and notices. The following is the list of papers:—Part vi. "Report on the Rainfall in Hertfordshire in 1888," by John Hopkinson; "The Hessian Fly and its Introduction into Britain," by Miss E. A. Ormerod; "Report on Phenological Phenomena observed in Hertfordshire during 1887 and 1888," by John Hopkinson; "Some Notes on the Lepidoptera of St. Albans and its Neighbourhood," by A. E. Gibbs; "Meteorological Observations taken at the Grange, St. Albans, during 1887," by John Hopkinson; No. vii. "Meteorological Observations taken at the Grange, St. Albans, during 1888," and "Climatological Observations in Hertfordshire in 1887 and 1888" (with map), by John Hopkinson; "Notes on the Chalk Rock," by Dr. J. Morison; "The Study of the Injuries and Diseases of Plants," by Dr. A. T. Brett; "Notes on the

Rearing of Cuckoos at Cassiobury, Watford," by John Powell.

We are sorry to have to record the death of Father Perry, F.R.S., of Stonyhurst, the distinguished astronomer and meteorologist, at the comparatively early age of fifty-seven. Father Perry was connected with the Venus Transit Expeditions of 1874 and 1882, and in the Solar Eclipse Expedition of 1886, 1887, and 1889. He was out with the recent Eclipse Expedition, and died, on duty, on the 27th of December.

MICROSCOPY.

Diplois propatula.—I should be much obliged if any observer who has had an opportunity of examining this rare species, would be so good as to communicate with me.—*David Bryce*, 37 *Brooke Road, N.*

Diplax compressa.—It may interest workers among the Rotifera to know that several examples of this handsome species have occurred in a recent gathering from a ditch on the Lea Marshes, near Spring Hill, Clapton. Mr. Gosse described the characters from a single specimen found at Leamington in July, 1850, and, so far as I can learn, no other specimens have yet been recorded.—*David Bryce*, 37 *Brooke Road, N.*

The Microscopical Society of Calcutta.—The winter session of this society opened on the 11th November last, when the president, Professor J. Wood Mason, read a paper on a "Viviparous Caddis Fly" discovered by him. At the close of the meeting the members examined a splendid gas microscope by Messrs. J. Swift & Son, which has been presented to the society by Sir Henry Cunningham, formerly a Judge of the High Court at Calcutta. The instrument is furnished with 2-inch, 1-inch, ½-inch, and ¼-inch objectives, and has a lantern fitting as well. It should help materially to popularize microscopy in Calcutta, as well as to illustrate papers, &c. We regret to learn that the deaths of Mr. E. J. Jones, the Vice-President, and of Dr. Vincent Richards, were announced. Mr. W. J. Simmons was elected Vice-President, and Mr. W. L. Sclater, Hon. Secretary of the society.

The Royal Microscopical Society.—At a recent meeting, Mr. C Rousselet exhibited a small tank for rotifers which could be readily moved about in such a way as to render an examination of the contents very simple, so that any desired specimens could be easily picked out. The lens used was a Zeiss's No. 6 Steinheil, the focusing being done by rackwork.—Mr. Crisp called attention to a number of stereoscopic photomicrographs of embryos by Professor Fol. They afforded a conclusive answer to the question brought forward at the October meeting as to whether stereoscopic photomicrographic slides had been produced before that time. Mr. Crisp also read some extracts from a paper by Mr. Gill, which seemed almost conclusively to prove that the "markings" on certain diatoms were apertures.—Mr. A. W. Bennett gave a *résumé* of his paper "On the Freshwater Algæ and Schizophyceæ of Hampshire and Devon." It was the result of collections made during his summer holiday in the New Forest and on Dartmoor, many of the species being not only interesting, but also new to science.—Mr. Crisp said, that at the last meeting mention was made of a new objective with an aperture of 1·60, the price of which was said to be 400*l.* Some doubt was expressed at the time as to whether the account was true, but since then several communications about it had been received. A letter from Professor Abbe describing the principles of its construction was read. Letters were also read from Dr. van Heurck describing the performance of the lens, and enclosing a series of remarkable photomicrographs of diatoms taken with it, with magnifying powers of 10,000 and 15,000 diameters.

New Slides.—Mr. Ernest Hinton, 12 Vorley Road, Upper Holloway, N., sends us two very neat and beautiful slides. One slide contains *Obelia flabellata*, one of the Hydroid Zoophytes, and shows the tentacles fully extended, and also the gonophores. The other, for the polariscope, is *Bugula avicularia*, and is prepared to show the interesting "bird's-head processes," some of them with the beak open, others with it closed.

ZOOLOGY.

Irish Shells.—I am able to place the following species on record from Rynn, Rosenallis, Queen's Co., Ireland:—*Succinea putris* (Linn.), *Vitrina pellucida* (Müll.), *Hyalina alliaria* (Mill), *H. crystallina* (Müll.), *H. fulva* (Müll.), *Helix aspersa* (Müll.), *H. nemoralis* var. *carnea* 12345, *H. hortensis* var. *lutea-unicolor*, *H. rufescens* (Penn.), *H. hispida* (Linn.), *H. caperata* (Mont.), *H. ericetorum* var. *alba* (Charp.), *H. rotundata* (Müll.), *H. pulchella* (Drp.), *Pupa umbilicata* (Drp.), *Vertigo antivertigo* (Drp.), *V. edentula* (Drp.), *Clausilia rugosa* (Drp.), *Cochlicopa lubrica* (Müll.), *Cæcilianella acicula* (Müll.), *Sphærium corneum* (Linn.), *Pisidium Amnicum* (Müll.), *P. fontinale* (Drp.), *P. pusillum* (Emel.), *Anodonta anatina* (Linn.), *Planorbis albus* (Müll.), *P. umbilicatus* (Müll.), *P. contortus* (Linn.), *Physa hypnorum* (Linn.), *P. fontinalis* (Linn.), *Limnæa peregra* (Müll.), *L. stagnalis* (Linn.), *L. palustris* (Müll.), *L. truncatula* (Müll.), *Bythinia tentaculata* (Linn.), and *Ancylus fluviatilis* (Müll.). None of the above species, I believe, have been recorded for Queen's County, and three of them, *Cæcilianella acicula*, *Pisidium Amnicum*, and *Anodonta anatina*, are entirely new to Ireland. They were collected by Mr. G. Croasdaile.—*Joseph W. Williams.*

Variation in the Mollusca.—A few words only in reply to Mr. Cockerell's remarks on the first part of my paper under this heading, which were published on pp. 211-213, *ante.* The majority of his strictures have been, I think, sufficiently answered in Part II., published in the August number. A word or two as to my impressions of the meanings of the words "species," "variety" and "form." The definition of the word "species" is to me a class of individuals each of which can be considered to be the descendant of the same protoplast or of the same pair of protoplasts; a "variety" as a class of individuals, each of which belongs to the same species, but each differing from other individuals of the species in the points wherein they agree amongst one another. The word "form" to me has practically the same meaning as "variety"; theoretically, a "form," however, may be considered as less constant than a "variety," and occurring more spasmodically. What may be considered a "form" on Hampstead Heath may be considered a "variety" in Worcestershire. My impression of the meaning of the word "form" will be seen not quite to accord with that expressed by Mr. Cockerell, who thinks them "a grade less distinct than varieties proper, as varieties are than sub-species and sub-species than species" —a definition working on which it is no wonder that he has never been able to satisfy himself about the line to be drawn between "varieties" and "forms." With regard to the various illustrations drawn of the tree, names of people, names of chemical compounds, etc., I say little, for when they are looked into and thoroughly examined they have none but a very superficial relation to the matter of variety-names. But Mr. Cockerell adds, "The common language has grown to suit the popular mind, and is too illogical and loose in its application for scientific names." It will be noticed by the reader that I said nothing about the common language of the popular mind, but of the exact colour-terms of the English language; white is white, red is red in that language and nothing else. And what shall we say to some of our Latinised variety-names? *Planorbis umbilicatus* (*complanatus*) var. *albina* is described as white or colourless; *P. contortus* var. *albida* as nearly white; *H. hortensis* var. *albina* as whitish or white; *H. cantiana* var. *alba* as entirely opaque white; *H. hispida* var. *albida* as white or colourless; and so on. What I say is, that it is better for the sake of exactness to describe a variety simply as white, opaque white, whitish, colourless, or whatever it may be; then these so-called "scientific names" will not be "illogical and loose." Linné's *fragilis* is, I believe, generally known to English workers by Jeffreys' description: "shell much smaller, narrower, thinner, amber-coloured"—whether it be the exact thing which Linné meant when he described *Helix fragilis* in his "Systema Naturæ," I will not decide, and does not matter much to me; but what does matter is that Jeffreys' description is what is meant when the word *fragilis* is used by the great majority of present-day conchologists. The translated description of Moquin's var. *pumila* is "shell much smaller, amber-coloured." I understand Locard's var. *fulva* of *B. tentaculata* as a "tawny" and a "shiny" one; and if this be so, I do not see much difference (not enough at any rate to warrant a Latinised name did I believe in naming "unicolorous colour-changes") from the typical yellowish, horn-coloured and glossy type. I give a large discount to *aterrima* of *A. ater* for the same reason. I neither see anything between vars. *fragilis* and *pumila* of *L. stagnalis;* the descriptive difference is that *fragilis* is narrower and thinner (than the type), while these two attributes are not given by Moquin to his *pumila*, but *primâ facie* (because it is described as "much smaller" than the type) they are not to be denied it. I do not see why Mr. Cockerell should demur to my retaining *Limnæa peregra* var. *ovata*, even if he may "be an old fellow, fat with rest and good living," which I am not as prepared to admit. It is a good structural modification of the type-shell. The fact that "Hazay says typical *peregra* can be produced from *ovata* by transplanting the eggs of the latter to water which contains much carbonic acid," I consider as proving very little indeed. I should expect some of the eggs of *ovata* to resolve into typical *peregra* if transplanted into any water or even if kept in the water of its own pool; I think every biologist would expect the same, for they would but be "reversions to ancestral conditions." Indeed, if no resolution occurred, I should begin to think it a distinct species and not a variety at all. I should expect the same of any variety. In conclusion, it appears from the commencement of Mr. Cockerell's note that in his opinion it is the best thing, whichever way you take, to have "the whole hog or none;" but personally I am of the opinion that it is well in this matter, as in others, to steer a middle course. I condemn not all things in the council of the variety-mongers, nor do I approve all things in the synod of those who go the polar opposite to variety-naming in its totality.—*J. W. Williams.*

N.B.—In Part III. p. 203, second column, line two from top, the word "*foundation*" should be "*fecundation.*" On line sixteen the comma should be deleted between Sedgwick and Minot.—*J. W. W.*

Additional Worcestershire Birds.—Hen harrier, *Circus cyaneus*, L., Alcester; red-breasted merganser, *Mergus serrator*, L., Clifton-on-Terne; kittiwake, *Rissa tridactyla*, L., Spetchley.—*F. G. S.*

Metamorphoses of the May Fly:—Mr. Swinton, who wrote in the December number of the "Metamorphoses of the May Fly," seems to have seen it in its so-called sub-imago or pseudimago, stage. Westwood says that, after casting the pupa skin, "they then make their way flying with difficulty to the shore, where they affix themselves to the trunks of trees, stems of rushes, walls or even persons standing on the bank, when they again cast off a very delicate pellicle in which they had been entirely encased. . . . . After this process the wings, disengaged from the outer covering, assume a bright appearance, and the tails grow to twice their previous length." I find the above quotation in Vol. ii. of Standard Natural History, Professor J. S. Kingsley editor.—*H. E. V.—U.S.A.*

Helix Pygmæa and H. Aculeata :—Illness prevented me seeing the December number of Science-Gossip till last night, where I saw that Mr. Arthur Mayfield records *Helix pygmæa* and *H. aculeata* as having been taken by him in the neighbourhood of Norwich, he thought for the first time. If he looks in the "Zoologist," March, 1850, he will find both species reared by my father, and also in the 'Transactions of the Norfolk and Norwich Naturalist's Society," 1872, page 47, by myself. No doubt he has overlooked these two lists of land and fresh-water shells of the neighbourhood of Norwich.—*John B. Bridgman, F.L.S.*

BOTANY.

Flora of Barra and South Uist.—A capital paper by Mr. Alex. Somerville, B.Sc., appears in Transitions of the Natural History Society in Glasgow on the above subject. Mr. Somerville has worked the flora of those islands well, and herein gives a sketch of their physical structure, and minute accounts of all the plants he collected down to the freshwater algæ.

The Bee and the Willow.—In Mr. Darbishire's note in Science-Gossip for December, he supports Müller's view that the willow is entomophilous I think there can be very little doubt that this is the case, having regard (1) to the "special modifications" quoted from Müller by Mr. Darbishire, which seem to have been obviously developed to attract insects, and (2) to the exceptionally wide circle of insect visitors, which I quoted from Müller in my note on this subject (Science-Gossip, August, 1889). As to the question of the superior attractiveness of the male, and the consequent likelihood that the female would not get visited, I cannot say I think Mr. Darbishire's proposed explanation is a good one. Is there any reason for supposing that a bee would take up so much pollen as to be obliged to get rid of some? Have bees ever been known to do this? It certainly seems a most unlikely supposition. Again even if this were the case, it is improbable that instinct is inherited experience, and I do not see that we are the least justified in assuming that either instinct, or experience gained during its lifetime, would prompt the bee to go to the female to get rid of the supposed excess of pollen. The female probably gets fewer visits than the male, but I should say it gets quite enough for pollination to be effected in very many cases, from the number of bees I have observed on the female spikes of *S. caprea* on a bright April morning. I do not see that any special explanation is needed to account for the bee visiting the female. Compared with the general state of vegetation at the time of flowering, the female spikes are sufficiently attractive, and what more natural than when an insect has been over all the male bushes in a particular spot it should turn to the females? In an entomophilous diœcious plant, it is indeed absolutely necessary that the male should be the most conspicuous. I am inclined to think, after all, that Mr. Henslow is right about the willow being a degraded entomophilous plant. He says: "There is little doubt but that all wind-fertilised angiosperms are degradations from insect fertilised flowers" ("Floral Structures," p. 266); and this is a view now held, I think, by many botanists. The rest of the Amentiferæ are anemophilous, and their ancestor was no doubt entomophilous (the degraded perianth and other morphological characters point almost irresistibly to this conclusion) and through changing conditions reverted to anemophily.* Salix has now branched off and returned to the entomophilous condition. The circumstances which enabled it to do this Müller makes clear enough, and the characters it has developed in relation to it are also sufficiently obvious. Thus we seem bound to agree with Henslow's view. He says—"The genus Plantago, like *Thalictrum minus*, Poterium, and others, well illustrates the change from an entomophilous to the anemophilous state . . . *P. media* . . . illustrates, not a primitive entomophilous condition, but a return to it; just as is the case with *Sanguisorba officinalis* and *Salix caprea;* but these show no capacity of restoring the corolla, the attractive features having to be borne by the calyx, which is purplish in Sanguisorba, by the pink filaments of Plantago, and by the yellow anthers in the Sallow Willow" ("Floral Structures," p. 271). Since the willow has passed through the anemophilous state, we have the explanation of its flowers appearing before the leaves, and the other facts are explained in exactly the same way as stated in Mr. Darbishire's two concluding paragraphs. We merely have to consider these anemophilous ancestors to have been

* I know that the absence of perianth in Salix inclines one to think it a primitive form; but its affinities, though somewhat obscure, are probably with the Cupuliferæ, Betulaceæ, etc., with which it is often classed as Amentiferæ. Many of these have rudimentary perianths, and from the analogy of the Chenopodiaceæ, etc., which are certainly descendants of entomophilous forms like Caryophylleæ (Eichler classes them together as Centrospermæ), it is hard to resist the conclusion that they are degenerate entomophilous forms.

themselves descended from entomophilous ones.—*A. G. Tansley*, 167, *Adelaide Road, N.W.*

Ranunculus Lingua.—(Science-Gossip, Jan., page 3.) Mr. Biddiscombe is wrong in supposing that the plant he has found is *R. lingua*, L., or even a variety of that elegant and well-marked plant. It is a well-known variety of the lesser spearwort (*R. flammula*, L.), which I have found in a very fine condition in Sussex. This plant is one of the most protean of the ranunculi, and a good series should be procured, ranging from what might be called *pseudo-lingua* to *pseudo-reptans*, and thence to *eu-reptans*. It is a little curious that the large variety referred to above should have been allowed by modern botanists to drop out of the list of varieties, seeing that in Gerarde's day it was well-known, figured, and described as the serrate-leaved or jagged spear-wort (*Ranunculus flammeus serratus*, Gerarde, Emac. p. 962). It is certainly more deserving of a varietal name than many other modern creations.—*Hilderic Friend, F.R.S.*

Linum Perenne, L.—In answer to Mr. H. J. Perrett's query with respect to this as a plant of the Isle of Wight, it is most likely that the species he saw was *L. angustifolium*, which is "frequent in all the sub-districts both inland and near the sea" (Townsend's "Flora of Hampshire"). The only report of *Linum perenne* for Hants known to me is in "The Annual Hampshire Repository," for 1779, where it is given for Wickham, by Dean Garnier and the Rev. Mr. Poulter, but this is held a mistake by Mr. Townsend. The mention of this Linum calls to mind a paper by Dr. P. Q. Keegan in the September number of last year's Science-Gossip, where, among some interesting notes on the county of Sutherland, he names four species that are quite unknown to botanists as going so far north, *i.e.*, *Ranunculus lingua*, north to Ross and Elgin; *Lepidium Smithii*, north to Ross; *Geranium pusillum*, north to Inverness and the Inner Hebrides; *Linum angustifolium*, not known as a Scotch species, and Lusitatissum, suggested as the plant seen. It is much to be desired that specimens of such species as the above should be gathered by the recorders of them. There is just that amount of probability that the Linum might have been found, that makes it difficult to neglect the record, as *Polygala calcarea* (!) has been found on the limestone in Sutherland. Still, it might more reasonably have been predicted that such counties as Wigtown, Dumfries, or Kirkcudbright were much more likely habitats, as species that fail in the north of England do in several cases reappear in the south-east of Scotland. To those who study the distribution of our flora, it is not only the fact that certain species are to be found, but the connection with other floras that makes all the northerly records of such value when they are verified by specimens. There are others in Dr. Keegan's paper that need to be verified by specimens before acceptance for Sutherland, *i.e.*, *Galium Mollugo*, *Orchis Morio*, *Valerian dioica*; *Pinguicula Scotica* is doubtless a slip for *Primula Scotica*, but what is intended by "*Salsola maritima?*"—*S. Kali*, or *Suæda maritima?* Mr. H. C. Watson's works are now so accessible that recorders ought to take the trouble to see if their plants are new or not to a county, and it so greatly adds to the interest of their papers, anyhow in the eyes of botanists.—*Arthur Bennett.*

GEOLOGY, &c.

Glasgow Geological Society.—At a recent meeting of the above society, there were elected—Mr. J. Collins, general secretary; Mr. White, secretary of committee, and Mr. Madison, curator. The other officers were re-elected. The election of committee and vote of thanks to retiring officers brought the meeting to a close.—On November 11th, Mr. H. Hawkes exhibited specimens of *Osmunda regalis; Ophioglossum vulgatum* and *Botrichium lunaria*, our only native examples of exannulate ferns. Mr. P. T. Deakin then read a paper on "Notes on the Country Around Christchurch, Hants." The writer described the situation of the town, and referred to its history and antiquities. It was once a seaport, but the harbour has become silted up until no large vessel can enter it. The great charm of this district to the scientist is its geology, for it gives us an almost complete section from the Lower to the Upper Eocene in the space of a few miles. In the Bournemouth beds we find impressions of leaves and the remains of tree trunks, the latter bored through and through by marine mollusca of which, however, we could find no trace. Although some organic remains are to be found nearly all along the coast line, yet it is only when we come to Barton Cliff that they really abound. The writer gave lists of those commonly found and also of those less frequently met with. One part of the coast was particularly interesting, from the fact that the change from marine to fresh-water species was well seen. A description of the land, fresh-water and marine shells was also given. The paper was illustrated by collections of fossil and other shells.

Enormous Reptile from the Cretaceous Deposits of America.—In the last number of the "Geological Magazine" Professor Marsh, the distinguished American palæontologist, figures and describes the skull of the gigantic fossil horned lizards found in the cretaceous deposits of North America. The species figured is *Triceratops flabellatus*, whose skull is six feet long. The strata in which these remarkable fossils occur extend for about eight hundred miles along the eastern flank of the Rocky Mountains, and are of freshwater or brackish origin. The skull of triceratops possesses many remarkable features. It is possibly the largest that any terrestrial animal, extinct or recent, ever possessed, and is only surpassed in size by that of the great whale. The specimen Professor Marsh describes is the skull of a young animal, and he thinks that an adult specimen would have been almost eight feet long. The armature of the skull consisted of a sharp-cutting beak in front, a strong horn on the nose like that of a rhinoceros, a pair of very large pointed horns on the top of the head, and a row of sharp projections along the posterior margin of the crest of the skull. Professor Marsh says that for offence or defence these form together an armature for the head as complete as any known. Such a high specialisation of the head resulting in its enormous development, profoundly affects the rest of the skeleton. Precisely as the heavy armature dominated the skull, so the huge head gradually overbalanced the body, and must have led to its destruction. As the head increased in size to bear its armour, the neck, first of all, then the fore-limbs, and later the whole skeleton, was specially modified to support it.

NOTES AND QUERIES.

Pin-feathers of Woodcock.—These small feathers with a lance-like plume and a rib-like wire are sought after for some purpose. Can any reader tell me what? I believe there is some special work for which they are preferred to camel-hair pencils. The ladies can perhaps explain.—*W. A. Gain, Tuxford, Newark.*

Arion Ater.—On breeding between one of the black variety and a creamy white or light buff specimen, I found all those hatched from eggs laid by the black slug were of the same light colour as the other parent.—*W. A. Gain.*

Young Arion Ater.—The light-coloured varieties of this species have, I find, darker stripes at the sides and round the shields, similar to those of *A. subfuscus*. These show themselves a week or two after the slug leaves the egg. When less than half-grown the difference in colour gradually becomes less as the other parts become darker, and finally disappears. Next year I hope to watch the development of the black and red varieties.—*W. A. Gain, Tuxford, Newark.*

Helix Caperata.—Has any reader of Science-Gossip noticed the existence of a second lip, or what resembles one, in any of their specimens of the above snail? It is situated about $\frac{1}{16}$ of an inch from the mouth or real lip, and has the singular appearance of the animal having completed its shell and then started growing again. Is this owing to premature development, from food or climatic agencies, or a case of "mistaken instinct"? It is not uncommon here, about one in ten being the proportion.—*W. Biddiscombe, Plumstead.*

The Cuckoo.—Mr. J. A. Smith will find the information he asks for by looking in any good descriptive book on birds. The following are some of the cuckoo's hosts recorded, viz.:—blackbird, hedge-sparrows, larks, meadow-pipits, tree-pipits, chaffinches and pied-wagtail. He will here see that the cuckoo does not deposit its eggs solely in the hedge-sparrow's nest. I do not see any connection in his note between cuckoo and magpie, only cuckoo and pied-wagtail being mentioned. I have received an egg of the cuckoo from Mr. Ellison, of Steeton, who has kindly furnished me with the following notes: Nest of tree-pipit on ground in small wood, found June 1st, 1889, containing six eggs, three of which were removed by cuckoo, and its egg deposited between June 1st and 4th; the three eggs of tree-pipit and one egg of cuckoo are now in my possession.—*F. W. Paple, 62, Waterloo Street, Bolton.*

Cuckoo and Magpie.—In answer to Mr. J. A. Smith's note under this head, I beg to quote the two following extracts. "They (cuckoos) lay their eggs in the nests of other birds, generally in those of little insectviorous passerines, such as the lark, robin, hedge-sparrow, redthroat, nightingale, thrush, blackbird, and sometimes also in those of the magpie, turtle-dove, and wood-pigeon."—*Figuier*, "*Reptiles and Birds*," p. 444.

"A blackbird's nest is sometimes selected to receive the deposit (*i.e.* the cuckoo's egg), but very rarely compared with the hedge-sparrow's, the lark's, meadow-pipit's, water-wagtail's or the chaffinch's."—*Rev. J. C. Atkinson*, "*British Birds' Eggs and Nests.*"

Spotted Dead-Nettle.—In answer to Mr. B. C. Robinson's inquiry respecting this plant, I should like to mention that it grows, apparently wild, in a lane at Earlham, near Norwich. I have also seen it cultivated as a garden plant.—*Arthur Mayfield.*

Great Yarmouth Naturalists' Society.—The November meeting was held on Nov. 27, when four persons were proposed for membership. Mr. W. Fulcher read a short paper on the various organs of different insects and beetles, illustrating it by several interesting slides shown under the microscope. A very interesting paper on "Mollusca of the Great Yarmouth District" was given by the secretary, Mr. J. B. Beckett, who, in describing the local forms and their habitat, enumerated as many as seventy-eight species found by him up to the present. This list will shortly appear in print, and will form a valuable addition to the fauna of Great Yarmouth, no previous list having been published. The secretary exhibited his collection of local shells, also his collection of British shells, numbering 200. Votes of thanks to the readers brought the meeting to a close.

Colouring of Eggs.—I was much interested with Mr. Nunn's suggestion as to the probable cause of the occasional coloration of eggs at the narrow end instead of the broad one, and the idea he advances seems to me a very likley one by which to account for this variation, in at least some of the instances given. In the Falconidæ it is sometimes difficult to say which is the smaller end of the egg, though frequently the difference is tolerably well marked, but I have noticed the variation to be very frequent in this family. I can also corroborate Mr. Nunn's statement as to the great number of these abnormally marked eggs occurring amongst the Corvidæ, and have also frequently noticed them amongst those of the blackbird, songthrush and misselthrush, where perhaps the egg is relatively larger in proportion to the size of the bird. I don't know if Mr. Nunn has had opportunities of examining large numbers of sea-birds' eggs, but it is certain that this phenomenon does appear amongst them, and that not very unfrequently, although I admit they are much rarer than in some of the families named already. I have seen eggs so marked of the herring-gull, guillemot and razorbill, and have specimens of the two former in my cabinet. These were noticed amongst many hundreds freshly taken by the climbers on the cliffs of the Yorkshire coast. I have not noticed the eggs of the kittiwake to present this peculiarity (but that may be because I have not been on the look-out for such an occurrence), although I have seen hundreds of eggs. Perhaps some physiological reader of SCIENCE-GOSSIP could say if it is possible for such an egg as, say that of a guillemot, to become reversed in transit along the oviduct; would it not be analogous to the turning of a fœtus in the mammalia? Perhaps the egg in these latter cases may enter the oviduct narrow end first. Have any eggs been noticed presenting the reverse way, on dissection of the parent? As Mr. Nunn suggests, it seems unlikely that these relatively large eggs should turn, after once entering the oviduct. I may say that the guillemot egg so marked in my possession, is comparatively short, yet the herring-gull's is rather longer than usual. It would be very interesting to hear what other eggs have been noticed by collectors, presenting this type of colouration.—*J. A. Wheldon*, 20 *High Ousegate, York.*

GATHERING AND STORING NUTS AND FILBERTS.—So soon as the nuts become brown, and separate readily from the husks, they are fit to eat. But for long sound keeping they should be what is called dead ripe before gathering. It is rather difficult to keep filberts in the husks; still, it may be done with more or less success by thoroughly drying the latter, either in the sun or with sulphur fumes, before packing into air-proof jars or pots. The latter, if not over done, is best, as it removes all the moisture from the husks, partially bleaches them, and destroys the germ of the mould, or fungi, that mostly accelerates their decomposition. It is a mistake to add salt, or anything else, to filberts. They keep far better without, packed closely and stored in a fairly dry store-room. Nuts out of husks keep best packed in jars in a similar manner, closely covered over, and buried about a foot deep in dry soil. Thus stored, they retain their original sweetness and moisture for many months.—*From* "*Cassell's Popular Gardening*," for December.

A MONSTER OF THE DEEP.—A correspondent writes:—"On the little strand at Dugort, in Achil Island, on the west coast of Mayo, now lie the remains of one of the most curious creatures perhaps to be met with in all the animal creation. It was stranded for some months on one of the outlying reefs at the entrance of Blacksod Bay, where the villagers took it to be the carcass of a large whale. It was afterwards carried on to the Achil strand by the late gale, which swept over the Western Ocean on the night of October 4th. This large sea monster is none other than the gigantic squid, or king cuttle-fish, and is rarely seen on our shores. To what species of the Œmmestephes it belongs will ever remain unknown, as it was too far gone in decay, and was shorn of all its beauty. The suckers and horny rings had fallen off long before it reached the strand, and the parrot-like horny beak, which is peculiar to this animal, was also missing. The animal, though shrunk and distorted, measured as follows:—Length of tentacles, or long arms, thirty feet each; circumference of body, including short arms, sixty feet; the circumference of tentacles in some places, four feet. I know of only four instances of the appearance of this strange monster in British waters: one was stranded on the shores of Kerry more than two hundred years ago; another is reported as having occurred off the Banks of Newfoundland; one is recorded by the naturalist, Mr. Gwyn Jeffries, from Shetland; and the last we read of was taken off Boffin, Isle of Mayo, about fourteen years ago, and identified and recorded by the naturalist, Mr. A. G. More of Dublin. Portions of this animal are now in the Dublin Museum. A very faint idea can be gathered from what is preserved in museums of this curious creature, as it shrivels away almost to nothing except a large cartilage pen, which runs across the body, and branches off to the short arms. It would take a vessel as large as the hull of the Great Eastern filled with spirits to show off the animal for exhibition. Curious tales are often told by mariners about this sea-monster. Its enormous arms or tentacles are armed with formidable suckers and horny rings, which are set with small teeth, pointing inwards. These long arms, seventy feet in length when outstretched, as they toss about in the ocean, may have given rise to the story of the sea serpent. It is curious that three out of the whole number of these animals of which we have record should have been stranded on the west coast of Ireland.—"*Bristol Times and Mirror.*"

NATURAL HISTORY NOTES.

From Hallowtide to March the milling seeds that have been dried on the kiln, and are used in this part of the country as fuel, will burn for three days if kept tight together. After March, when vegetation commences, the same quantity will only last three hours. What is the reason of this?

A miller states that it is a well-known fact that water is heavier at night; that it took less to turn the mill than in the day-time. Steam is the same between one and two o'clock in the morning. Query, Does water rest?

Can any of your readers explain why wasps preferred eating the outside skin of one particular dahlia and never touched the other dahlia plants? Underneath this plant they lay in a stupefied state.

The bark of several elm trees were eaten all round the bole to the height of about ten feet, more than three years ago, by horses; the trees seemingly have not suffered. I have also seen an ash bared of its bark several feet from the ground six years ago by goats; it is also in full vigour. How have they received nourishment? The sap, which is supposed to permeate through the bark, being off, the wood is quite seasoned.

The following account of a cuckoo is narrated by the late J. Templeton, Oranmore, Belfast, who was well known as a naturalist and botanist: "A tame cuckoo, which my daughter Ellen Templeton had for about two years, sometimes changed the position of its toes, bringing the toe apparently joined to the back toe forward, so as to have then three toes forward. It also sometimes endeavoured to climb up the rods of its cage, but as they were very smooth it made but little progress."

In a paper read before the Linnean Society, June 16th, 1818, by the Rev. R. Sheppard, F.L.S., it is stated that "the genus Cuculus is furnished with two toes before, and two behind, and yet is actually never known to climb at all."—*Rev. S. A. Brenan, Rector of Cushendeen, co. Antrim.*

PURPLE LOOSE-STRIFE.—Almost every one who has any experience of the country will have noticed the beautiful purple spikes of flowers which the purple loose-strife so plentifully throws up during the latter part of summer, and which render it so conspicuous an ornament on the banks of rivers and ponds. We have often wondered that our landscape painters have not more extensively availed themselves of such characteristic wild growths as the present to give an added charm to their work, and furnish it with another proof of its truthfulness to nature. The water-lilies, both yellow and white, and the great reeds and bulrushes are often introduced, and the fine large leaves of the butterbur are given very effectively; but we can only recall a very few instances of the introduction of the graceful and brilliantly-coloured purple loose-strife into representations of the tangled mass of vegetation that fringes the stream.—*From "Cassell's Familiar Wild Flowers,"* for December.

THE CUCKOO'S SONG.—Mr. W. P. Hamilton, in the December number of SCIENCE-GOSSIP, page 278, states the male birds are the singers, but it appears this statement is not made on his own authority; but so far as my observation goes, I can speak positively as to the female birds singing, and believe the male bird does not sing but merely chatters.—*W. H. T.*

EARLY SPRING CALL OF PICUS MAJOR.—I heard and saw the instrumental spring call of the great spotted woodpecker (*Picus major*) made by tapping a broken-off and vibrating branch, on Thursday last (January 9th)—very early; never heard it until March before. I have heard and seen *P. minor* do this, but not *P. viridis*, though he is said to do it, and is much commoner.—*A. Foster-Melliar, Sproughton, Ipswich.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

E. W. M.—Your article reached us safely, and will appear as soon as possible.

A. BENNET.—We should be glad to get an abstract from you from the Report of the British Association, as you suggest.

W. B. (Northampton).—Your bottle came completely smashed, but we were able to make out the objects, which are common freshwater shrimps, and are perfectly harmless.

E. M.—We shall be very much pleased to see one of your compact cabinets for micro-slides.

A. J. ADAMS.—The "gelatinous lichen" is a species of *Nostoc*, but it came to us too decomposed to identify the species.

W. M.—We have been unable, after much enquiry, to get the address of Reichert, the maker of objectives. Perhaps some of our readers can supply us with it.

BEETLES.—The names in this answer were misspelt. They should be *Aphodius prodromus*, and *Phædon tumidulum.*

J. SMITH.—Apply to Miss Jelly, Hatchlands, Red Hill, Surrey.

J. BISHOP.—Many thanks for your offer; but we hardly think the subject would be suitable to our pages, especially as we are already overcrowded with matter.

MICROSCOPE.—Davies, "On the Microscope" (Messrs. W. H. Allen & Co.) would suit you well. Get the shilling vols. on "Entomology" ("Collecting and Preserving" series) published by Sonnenschein.

F. C. KING.—"Metamorphism of Rocks," by Dr. A. Irving, published by Longmans at (we believe) five shillings.

EXCHANGES.

WANTED, Le Maout and Decaisne's "Botany" (Hooker's translation), and Rosenbusch's "Petrographical Tables."—F. C. King, 2 Stanley Place, Preston.

OFFERED, *Clausilia biplicata, Helix pisana, Sph. rivicola, S. ovale, Zon. excavatus, B. montanus, C. elegans*, and other good British shells, in exchange for mounted or unmounted micro objects, chiefly zoological.—Henry C. Langdon, Castledown, Ashburnham Road, Hastings.

WANTED, well-mounted slides of pathogenic bacilli. For exchange, can send good list of slides by Cole, Doherty, &c.—Albert Norris, Fern Acre, Urmston, Manchester.

DAWSON'S "Chain of Life," Hay's "Fungus Hunter's Guide," in exchange for good text-book on entomology, or slides (entomological or botanical).—"Acheta domestica," 76 Clifton Street, Lytham, Lancs.

"THE Ibis," in parts (clean), for 1867–9, in exchange for Fowler's "British Coleoptera," 3 vols., or what offers?—Wm. Jeffery, Ratham, Chichester.

WILL exchange new copy of Beale's work on the Microscope for Carpenter's ditto.—Arthur H. Williams, Hythe.

WILL exchange a collection of foreign stamps for any of the following: ambulance or dissecting instruments, violin, cornet, or natural history books. Also magneto-electric machine in exchange for a cornet.—F. Cartwright, 20 Eldon Street, Manchester.

SHELLS.—*Unio margaritifer, Nucula nucleus, Pectunculus glycimeris, Cyprina islandica, Scrobicularia tenuis, Tectura testudinalis, Trochus tumidus* and *ziziphinus* var. *Lyonsii, Natica montacuti, Trichotropsis borealis, Trophon truncatus, Fusus antiquus* and *gracilis, Otina otis*, and others more common, in exchange for others not in collection, or micro-slides, insects, and eggs.—Wm. D. Rae, 23 Pekin Street, London, E.

DUPLICATES.—70, 79, 121*b*, 200, 270, 291, 318, 321, 369, 376, 613, 619. *Coronella minima, Borycnium hirsutum, Silene saxifraga, Linum Leoni, Alsine setacea.*—S. Mottet, 30 Quai d'Orléans.

WANTED, L.C., 8th ed.: 38, 68, 87, 106, 160, 218, 236, 241, 258, 312, 332, 389, 550, and many others. Offered, numerous Continental species. Send oblata list to—C. Copineau, Juge au Tribunal, Doullens, Somme, France.

WANTED, to exchange a nearly new silver lever watch for a good low angle $\frac{1}{8}$th objective.—Bray, Findon, Worthing.

OFFERED, 30 species of Scotch carboniferous fossils selected and mounted in cardboard cells (some rare forms). Wanted, Davidson's "Monograph of the Carboniferous Brachiopoda of Scotland," with 6 plates, 1860.—J. Smith, Monkredding, Kilwinning.

OFFERED, tobaccocite, a substance between peat and lignite, and crocadilite (small specimen), for any six species of fossils named and localized.—J. Smith, Monkredding, Kilwinning.

AGASSIZ'S "Bibliographia Zoologiæ et Geologiæ," Ray Society, 1848–54, 6 vols., octavo, cloth, good condition; Cuvier's "Animal Kingdom," half bound, green calf, good condition. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

WHAT offers (specimens, &c.), for 3 vols. SCIENCE-GOSSIP, 2 years in each vol., for 1877–82, neatly bound in cloth, clean and in good condition?—Jno. Schofield, 4 Shore Bank, Commercial Street, Huddersfield.

DUPLICATES.—*Zonites draparnaldi, V. edentula, Spherium ovali, Cl. laminata, Cochlicopa tridens, H. hor.* var. *minor, A. fluviatilis* var. *albina*, &c. Wanted, all varieties of *Helix aspersa.*—Robert Wigglesworth, 13 Arthur Street, Clayton-le-moors, Lancs.

OFFERED, five specimens of *Vertigo antivertigo, Vertigo alpestris, Vertigo substriata.* I will give any or all of them for a few examples of any of the following: *Succinea oblonga, Limnea involuta, Vertigo Lilljeborgi, Vertigo Moulinsiana, Vertigo tumida.*—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

SCIENCE-GOSSIP for 1884 and 1885, unbound, coloured plates, complete, offered for a second-hand copy of Shuckhard's "Bees," or Rye's "Beetles."—W. H. Warner, Fyfield, Abingdon.

FOR EXCHANGE, 2 micro-slides of Syenite rock and limestone, Dorset, by J. N. Also vol. 1 of "The Garner," 12 Nos. "Naturalist World," 13 Nos. Cassell's "New Popular Educator," up to date. Wanted, Books on birds or moths.—Norvill, 5 Montagu Street, Worthing.

WANTED, marine shells from north and east coasts, in exchange for those of Devon and Cornwall.—Mrs. Hodgson, Chalgrave Vicarage, Leighton Buzzard, Beds.

DUPLICATES of fossils, chalk, greensand, gault, oolite, lias, carboniferous, silurian. All named. Wanted, other fossil species, or any of Darwin's works, Figuier's works, or Taylor's "Common British Fossils."—Chas. Wardingley, 30 Blackwood Crescent, Edinburgh.

SCIENCE-GOSSIP, 1882 to 1889, to exchange. Wanted many species of British Birds' eggs in clutches.—H. Wells-Bladen, Stone, Staff.

BOTANY.—Wanted, odd numbers of "Annals of Botany," and De Bary's "Comparative Anatomy of Phanerogams and Ferns" (English edition). Also first-class botanical slides illustrating the histology of plants.—Chas. A. Whatmore, Much Marcle, Gloucester.

OFFERS wanted for complete set of SCIENCE-GOSSIP and other works in Natural History and General Sciences.—M., 56 Clarendon Villas, West Brighton.

SCIENCE-GOSSIP, 6 vols., 84 to 89 (complete), "Naturalist's World," 4 vols., 85 to 87 (complete), "Intellectual Observer," Jan. 1863 to Dec. 1866 (3 numbers missing), all unbound, but in good order, exchange micro-slides.—W. E. Harper, Norfolk Road, Maidenhead.

MICROGRAPHIC dictionary, microtome, and microscopic slides wanted. Offered, photo-lantern-slides of Rome, Pompeii, Vesuvius, &c., or state desiderata.—W. D. Stewart, 17 Upper Gilmore Place, Edinburgh.

OFFERED, a hand dynamo, in first-rate condition, lights four 5-candle power lamps, and gives current for all ordinary experiments in electricity. Desiderata, good section cutter, double or triple nose-piece, ½″, ⅙″, ⅛″, objective and microscopical literature.—R. Williamson, 137 Ardgowan Street, Glasgow.

Acme lineata, *Limnæa involuta*, *Testacella haliotidea*, round glass-top boxes, slides of various rocks, and the rarer sorts of diatomacæa; also wanted, books on Foreign Shells (illustrated); will give first-class specimens in return in either of following: land and freshwater shells, *Pyroxene andesite*, from the interior of Mexico, and prenite, which make rare microscopic slides, "Drift" containing minute shells, Echini spines, corals and other organisms, which are nice objects for mounting on slides, British marine shells, fossils, minerals, chips of Devonian corals and sponges.—Alfred Sclater, 23 Bank Street, Teignmouth, South Devon.

OFFERED, 50 carboniferous species of microzoa, selected and cleaned, mounted in open cardboard cells. Some very rare species. Wanted, 1½-inch objective.—J. Smith, Monkredding, Kilwinning.

WANTED, a copy of Grattann's "British Marine Algæ," in exchange for minerals, fossils, British shells, land and freshwater shells, chips of rare Devon corals and spongy forms, which when mounted make rare slides for the microscope, *Pyroxene andesite*, from the interior of Mexico, and prenite and dolerite, which also make rare micro-slides.—A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.

WHAT offers (in fossils or minerals) for 4 vols. in sixpenny numbers, of "Amateur Work," illustrating almost any kind of handicraft, such as fretsawing, wood-carving, painting on porcelain, violin-making, fishing-tackle, &c.?—P. J. Roberts, 4 Shepherd Street, Bacup.

"NATURALISTS' Monthly," first six parts, "Orwell Phonographer" (1888), and "Scientific News," parts 1 to 10, all unbound, in exchange for *H. pomatia*, *H. arbustorum*, and fossil shells.—Chas. Pannel, jun., East Street, Haslemere.

Wanted, Hogg's microscope, and Davis' book on "Mounting Microscopic Objects." Exchange choice micro-slides and rare British marine shells.—Suter, 5 Highweek Road, Tottenham, London.

OFFERED, L. C., 8th ed., 3, *Hepatica triloba*, 34, 36, 41, 43, 70, *S. capreolata*, 75, 80, 88, 104, 115, 119, 121*b*, 146, *Iberis pumata*, *Biscutella lævigata*, *Neslia panicul.* 163, *H. fumana*, 170, *Polyala comosa*, 195, *Saponaria ocynioides*, 200, 203, 206, 221, 289, *L. narbonense*, *L. Leoni*, 337, 349, 350, 357*b*, *Coronilla minima*, *Cystisus sessilifolius*, *Vicia peregrina*, *Argyrolob. Limseanum*, 497, 557, 592, 614, 625*b*, 643, 658, 682, 715, 733, 763, 766, 818, 826, *Picridium vulgare*, *Senecio gallicus*, *Phagnalon sordidum*, 910, 920, 941, 985, *Anchusa italica*, *Scrophul. canina*, 1031, 1118, var. *Salvia verticillata*, 1162, *Statice Limonium*, 1174, 1213, *Euph. palustris*, *E. Gerardiana*, *E. serrata*, 1335, 1338, 1345, 1358, 1425, 1517, *N. minor*, 1598, 1599, 1601, 1606, 1612, 1635, 1652, 1670, 1673, 1680, 1688, 1696, *Eragrostis megastachia*, *Brachyp. distachyon*, *Gaudinia fragilis*, *Glyceria nervata* (naturalized), 1719, 1767, 1770, 1773, 1781, 1792, 1815.—S. Mottet, 30 Quai d'Orléans, Paris.

TRANSVERSE sections of spine of echinus, *Acrocladia mammilata*, to exchange for other micro-slides.—T. M. Harvad, 6 Lingard's Road, Lewisham.

WHAT offers for the first six vols. of SCIENCE-GOSSIP, in publisher's cloth?—J. R. Hewitson, Red Hill, Surrey.

WANTED, Guizot's "Physical Geography." Will give in exchange other books, dried plants, &c.—J. W. B., 56 Vine Street, Liverpool.

Vols. 2, 3, 4, "Northern Microscopist," bound, six good microphotos by Dancer, "Naturalist's Notebook," Andrew Wilson, and 2 vols. "Postal Micro Journal," bound. What offers in natural history objects?—J. Henshall, Gorton, Manchester.

WANTED, R. Tate's "British Mollusca," or other good conchological book. Offered, "Chemical Analysis," Dr. Fresenius, 10*s*. 6*d*. cd.; "Chemistry, Theoretical, Practical, and Analytical, as applied to the Arts and Manufactures," vol. i., containing numerous excellent diagrams, an expensive work; "Handbook of Chemical Analysis for Practical Men," J. W. Slater, &c.—A. Whitworth, 65 Talbot Street, Southport, Lanc.

WANTED, good botanical micro-slides (sections stained), in exchange for hydroid-zoophyte mounts with tentacles extended (stained), sponge sections (spicules *in situ*), sponge spicules (spread) of *Leuconia nivea*, *Dercitus niger*, *Pachymatisma Johnstonia*, *Tethya Schmidtii*, *Desmacidon incrustans* (anchor-like), &c.—Geo. Swainson, F.L.S., North Drive, St. Annes-on-the-Sea.

"JOURNAL of Chemical Society," for last seven years, and other books, in exchange for "Geological Magazine," or other works on geology.—G. F., 51 Danby Street, Peckham, S.E.

OFFERED, *Succinea putris*, *S. elegans*, *Neritina fluviatilis*, *Planorbis nautileus*, *Physa hypnorum* and *Limnæa glutinosa*, in exchange for other shells not in collection.—F. W. Fierke, 1 Florence Terrace, Villa Place, Hessle Road, Hull.

WANTED, to borrow the "Journal of Botany," for 1888–9 for a few days. For this, excellent slides of marine algæ with reproductive organs are offered.—T. H. Buffham, Comely Bank Road, Walthamstow.

L.C., 8th ed., 335, 335*b*, 339, 341, 379, 576, 682, 692, 957, 973, 1196, 1419, 1423, 1629, 1630, 1791, 1813, and many others. Desiderata many. Desires permanent exchange with Highland or South of England botanist.—A. W. Walker, 55 Stonegate, York.

WANTED, good microscope; offered, good photographic outfit, collection of British plants, works on Botany, &c.—H. Fisher, 26 Stodman Street, Newark, Notts.

"HARPER'S Christmas Magazine," 1887–89, in exchange for micro-slides.—D. Kersey, 18 Palatine Street, Harpenhey, Manchester.

WRIGHT and Newton's patent oxy. hy. lantern microscope; three condensers, three achromatic objectives, two carriers, amplifier, line cage, and paper face-screen; complete instrument in case, good as new. Exchange for high-class table micro.—H. W. Case, F.R.M.S., Cotham, Bristol.

OFFERS invited for gem air-gun, ⅛th objective, Valentine's knife, air-pump, telescope, Wollaston's prism, &c. Wanted, Cassell's "Electricity in the Service of Man," also practical manuals on electric lighting, &c.—H. E. E., 344 Caledonian Road, London.

A. BONNET, 9 Rue Mazagran, Paris, offers 400 choice species of fossils from the Paris tertiaries, all correctly named, in exchange for fossils from all formations, or recent exotic shells.

BOOKS, ETC., RECEIVED.

"English Idylls," by P. H. Emerson (London: Sampson Low)—"Journal of the Royal Microscopical Society."—"The Canadian Bibliographer."—"On the Anatomy, Histology, and Affinities of Phreoryctes," by F. E. Beddard, M.A. (Edinburgh: Robert Grant & Son).—"The Antiquary."—"A Handbook to Scientific and Literary Bible Difficulties" (No. 1), by Rev. Robt. Tuck, B.A. (London: Elliot Stock).—"The Field Club."—"Springtide."—"Perspective Charts for Use in Class Teaching," by H. A. James, M.A. (London: Chapman & Hall).—"Alternative Elementary Physics," by John Mills (London: Chapman & Hall).—"Handbook of Quantitative Analysis," by J. Mills and B. North (London: Chapman & Hall).—"The Educational Annual for 1890," by E. Johnson (London: Geo. Philip & Son).—"The Element of Terror in Primitive Art," by Barr Ferree.—"On Marine Engine Governors and the Benefits Derived from them," by J. D. Churchill.—"The Geological Magazine."—"Essex Naturalist."—"Bulletin Bibliographique de la Librairie Française."—"Cassell's Technical Educator."—"Transactions of the Chichester and West Sussex Natural History and Microscopical Society."—"Journal of Microscopy."—"Journal of the Quekett Microscopical Society."—"Revue Bleue."—"Revue Scientifique."—"Transactions of the Hertfordshire Natural History Society."—"The Optical Magic Lantern Journal."—"Research."—"The Amateur Photographer."—"The Botanical Gazette."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope," &c., &c.

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

THE NEBULAR HYPOTHESIS.

No. 3.—*Conclusion.*

By E. P. RIDLEY.

WE have seen that the oval form of a nebula is due to the combined effects of gravitation and rotatory movement. But this implies an earlier state in which the figure was irregular. Now while the heavier portions of the nebulous mass were being drawn together so as to acquire a spheroidal contour, the lighter portions, floating further from the centre of gravity, would remain like detached shreds of cloud, or as long luminous streaks. And while most of these—though probably not all—would ultimately be compelled by gravitation to revolve about the centre of the mass, the lightest and outermost shreds would be a long time in acquiring a definite direction of rotation, and some would not be drawn in until the main mass had become considerably contracted. Such late arrivals coming from a great distance and therefore having small angular velocities, would move in very eccentric ellipses, and while they would come from all parts of the space which the mass originally occupied, they would come chiefly from regions remote from the plane in which integration had been most marked—that is, they would come from the poles of the nebula rather than from its equatorial regions—and having failed to accompany the retreating mass of the nebula while it was first acquiring a definite direction of rotation, their own revolutions would be determined chiefly by their irregular shapes, and would as likely be retrograde as direct. All this is true of comets—they come chiefly from high solar latitudes, along immensely eccentric orbits and in directions which are indifferently direct or retrograde. Many of them indeed have parabolic and hyperbolic paths, showing that they must be strangers to our system, and have come from distant regions of space. But as we can understand that some outliers of the nebulous mass would, by escaping the power of gravitation, get away into space, so outliers escaping from other systems, may find their way into ours. Comets are nebulous in constitution and of inconsiderable mass, too small to produce planets or even asteroids, but they probably concentrate into streams of meteors or shooting stars, a 100,000,000 of which, it is computed, are poured down upon the earth and planets each year. The connection between meteor streams and comets has been firmly established, and the chemical constitution of comets and meteors does not differ much from the chemical constitution of our earth; and though differing in their physical characteristics from ordinary rock, Sir Henry Roscoe says the earth's interior mass may partake of the physical nature of these metallic meteorites, and that the existence of such interior masses of metallic iron may go far to explain the well-known magnetic condition of our planet.

We have now considered a large number and a great variety of phenomena which arise in connection with the solar system—I will not stop to recapitulate them,—and with one solitary exception the nebular hypothesis explains all. Taken separately, many of the phenomena are alone almost sufficient, but together their influence is irresistible. I shall proceed now briefly to consider the future of the system, and then to notice two other theories, one accounting for the formation and heat of the original nebula, and the other a rival theory by Mr. Proctor.

The moon appears to afford an example of the universal death which, in a remote future, awaits all the members of the solar system. Indeed, this appears to be a necessary corollary due to the continual loss of heat. Besides this, two sets of forces are in connection with each member of the system struggling for the mastery—one set tending to drive the planets farther and farther away from the centre of the system, the other set tending to draw them towards the centre. Hitherto, probably the first set of circumstances has had the advantage, and there is little reason to doubt that all the planetary orbs, both primary and secondary, are somewhat larger now than they originally were. It has been proved that the tidal wave, caused by the attraction of the moon, has caused the earth to revolve more slowly by one eighty-fourth of a second than it did at the beginning of the Christian Era. The rotatory momentum thus lost by the earth is not destroyed, but is used up in driving the moon further from the earth, and the more slowly our planet rotates, the further the moon retires from it. A similar relation holds good in the case of the planets and the sun. As between the earth and the moon, to take one example, the ultimate result must be to lengthen our day until it corresponds with a lunar month, so that the earth and moon will move in relation to each other as if joined together by a rigid rod. While this is going on, there is also an opposing set of circumstances at work. We know there is no such thing as absolute space. The existence of some form of matter is absolutely necessary for the transmission of light and other forms of radiance, and this interplanetary matter offers resistance to the motion of the planets which must tend to diminish their velocities. This loss of velocity, if continued, would ultimately bring all the planets into the sun, one after another, beginning with Mercury and ending with Neptune. It has been calculated that the earth would attain a velocity of 379 miles per second immediately before striking the sun, and that the heat generated by the collision of the earth and sun alone, would produce a temperature of nearly 9,000,000° F., so that after the reunion of all the planets with the sun, the next stage would be the dissipation of the whole mass into an intensely hot nebula, probably not so large as the original nebula, owing to the dissipation of energy by means of the long-continued radiation of heat from the solar system into space. To go back now for a moment to the beginning, we may fairly surmise that the existence of an intensely hot nebula was due to some previous collision of cosmical bodies.

Although the nebular hypothesis has not at present been universally accepted, I am aware of only two rival theories. One of these, published about three years ago in Germany by two different men, sought to account for the formation of the solar system by a series of collisions, each collision accounting for the formation of a planet. Any number of collisions might be admitted, but it seems utterly impossible that such a series could produce one uniform system such as we have been considering, and I shall not dwell on this theory.

Last January Mr. Croll, admitting the nebular hypothesis, published what he terms the "Impact Theory" to account for the formation of the nebula. He assumes the existence of cold stellar masses in motion. From our previous considerations there should not be much difficulty in admitting the presence of such masses in space. The nebulæ which we can see, point to the presence of concentrated matter which we could not see. Further, it has already been pointed out that the planets will themselves ultimately become dark stellar masses. Should they then fall back upon the sun, as we have supposed, a hot nebula would again be formed by collision, but should other forces, at present unappreciated, prevent their ultimate collision, they would become stellar masses wandering in space, which is what Mr. Croll starts with. To account for the formation of our sun, he supposes two bodies, each one-half of the mass of the sun, moving towards each other with a velocity of 476 miles per second—the velocity being due partly to original motion and partly to the attraction of the two bodies upon each other. The collision would shatter the two bodies to pieces. The broken fragments now forming one confused mass would rebound against each other, breaking up into smaller fragments, and flying off in all directions, continually striking together and breaking up as they proceeded outwards. The heat of the collision would also generate an enormous amount of incandescent gas, which would act as a further expansive force. The heat evolved would be mainly concentrated on the surface layers of the broken blocks, and if we assume the specific heat of the gas to be equal to that of air, it would have a temperature of about 300,000,000 C., or more than 140,000 times that of the voltaic arc. The broken mass would, by the expansive force of the generated gas, be dispersed in all directions, breaking up into fragments smaller and smaller until the fragments would become gradually converted into the gaseous state and occupy a space as large as that embraced in our solar system, and we should then have a perfect nebula, intensely hot but not very luminous.

Laplace held that the solar nebula was intensely hot. Since his time, however, it has become more usual to consider the mass as being without heat, and accounting for the presence of heat as the effect of friction between the particles as the mass contracted under the force of gravity. It has been calculated that the heat generated thus by gravity would only give 20,000,000 years as the age of the sun. This time was thought to be much too short to account for the various geological changes exhibited on the earth, and Mr. Croll has accordingly formulated the "Impact Theory," which, accounting for a hot nebula, extends the age of the sun almost indefinitely, according to the force of the original collision or collisions. I must pass over the many interesting points raised by Mr. Croll, but I wish to draw attention to the fact that, according to this theory, meteorites may be broken fragments of two dark stellar masses which were shattered to pieces by collision, fragments projected outwards too quickly to be converted into the gaseous condition, and passing outwards into space with a velocity which would carry them beyond the risk of falling back into the nebula. They would then continue their progress in separate forms as meteorites. If this be their origin, then meteorites are the offspring of sidereal masses, and not their parents, as Mr. Lockyer concludes. In the same way Mr. Croll accounts for the origin of comets, supposing that the materials composing them were probably projected from nebulæ by the expulsive force of the heat of concussion which produced the nebulæ. Some of them, especially those with elliptic orbits, he says, may have possibly been projected from the solar nebula. This, it will be remembered, agrees with our previous account of the origin of comets. Mr. Proctor thought that comets of the solar system were formed, the larger ones by eruption from the sun and the smaller ones by eruption from the major planets. After pointing out in his work, "Other Worlds Than Ours," by a calculation which I cannot now follow, the enormous number of meteorites in our system and also the well-known connection between meteorites and comets, he rejects the nebular hypothesis, and advances, instead, the meteoric hypothesis. He supposes that originally the solar system consisted of a mass of meteorites in motion and that these aggregated around various centres to form planets; and he considered the strongest evidence in favour of his hypothesis was the fact that the sun and planets are growing, however slowly, by the meteoric hail which falls continually upon them. Without going further into this hypothesis, which appears in "Other Worlds Than Ours," it does not appear satisfactorily to account for the formation of a sun or of such planets as Saturn and Jupiter: it does not account for the graduated density of the planets which we have noted as existing, it does not allow for the formation of nebulæ such as we know actually exist in space; and the motion of planets formed, as he suggested, out of meteor swarms, would not, I consider, produce such a series of planets in one plane and with so great a uniformity of rotation and revolution as we have in the solar system. If this article were not already so long, I should have been glad to have devoted more time to Mr. Proctor's theory, but my subject was the nebular hypothesis, and that I have endeavoured to state fully and fairly. In doing so, all the points which Mr. Proctor raises by way of objection have been considered, with the exception of the difficult question of planetary periods, as to which he does not suggest that his theory offers a more reasonable explanation than the nebular theory.

The nebular hypothesis is so highly probable as to have gained almost universal acceptance. In fact, it contains very little of a hypothetical nature. Mr. Mill says: "It is an example of legitimate reasoning from a present effect to its past cause, according to the known laws of that cause." And I would add, if it is not a true theory, one would almost think it deserves to be so.

*** The writer is specially indebted to John Fiske for the materials used in the above article. "The History of a Star," by J. Norman Lockyer, published in the "Nineteenth Century" of November last, after the above article was written, requires consideration.

THE COLOURING OF THE EGGS OF WILD BIRDS AT THE SMALLER END.

A FEW further remarks on this subject may not be out of place now the season for making observations is coming on.

In looking over a number of smaller-end-marked eggs, it will be seen that those of the Falconidæ retain their normal form and character, whilst those of several other birds assume two distinct types. In one type the eggs are short and abruptly pointed, in the other they are long and narrow. Mr. T. C. Wright mentions this type in the January number of this journal. The former type sometimes forms the greater portion of a full clutch, but as a rule the eggs of the latter type are found as single specimens. I have now before me two clutches of the first-mentioned type, each containing five eggs, one being of the robin (*Erithacus rubicula*), in which three of the eggs are marked at the smaller end, the other of the white-throat (*Sylvia cinerea*), in which two are marked at the smaller end, the remaining eggs in both clutches being faintly marked in the usual manner.

Two misshapen eggs in a clutch of whinchat (*Pratincola rubetra*) have a well-defined zone of colour around the smaller end. An egg of the pied wagtail, and also one of the great tit, show what may be termed the false marking, but as the last two mentioned eggs were taken by pilfering collectors, I have no history with them. The birds referred to above all lay full-sized eggs, and not more than two per cent. are coloured at the smaller end.

The red-legged partridge, which lays a small egg, has a strong tendency to draw the colour to the lower portion of its eggs.

It was suggested that the large percentage of the eggs of the Falconidæ having the false marking was owing to the egg becoming reversed in the oviduct during the abrupt turns, twists, and gyrations performed by the bird in the capture of its prey. I doubt if there is much cogency in this suggestion, for a series of clutches of the swallow (*Hirundo rustica*) do not show a trace of false marking, and this bird performs during a day's flight far greater aërial gymnastic feats than the Falconidæ.

Having brought under notice several birds supporting the theory that birds laying small eggs in proportion to their size lay a greater percentage of false-marked eggs than other birds, one bird must be called in evidence against it, *i.e.* the cuckoo. This bird most certainly lays a small egg, not more than one-fourth the size it should do to be equal with other birds of its size and weight, nevertheless a cuckoo's egg marked at the smaller end is as great a rarity as the "four-leaved shamrock;" the writer has never seen a trace of false marking in any of the cuckoo eggs he has had the opportunity of examining. On the 3rd of July, 1884, the writer took from the nest of a tree pipit an egg of the cuckoo so immediately after it was laid that the albuminous moisture with which eggs are covered when first laid was not dry. In this case but little time could have been taken up in the selection of a suitable nest: this egg fairly blended with the pipit eggs, but was slightly lighter in colour.

The great immunity these eggs enjoy from false marking is doubtless owing to the cuckoo being able to colour its eggs at will, or perhaps more probably by impression; if it were not so, the bird would more often be seen carrying its egg in search of a suitable nest or suitable clutch of eggs in which to place it. All the cuckoo eggs the writer has found and taken fairly represented the eggs amongst which they were placed.

After all, it may be that it is the exclusive prerogative of the Falconidæ to colour their eggs at the smaller end, and that all other eggs showing a similar coloration, are the result of either permanent or temporary physical defect in the bird producing them. If permanent, it is probable that more false-marked eggs would be met with. The long narrow type of egg is not so frequently met with, rarely two are found in the same clutch, excepting amongst those of the tree-sparrow (*Passer montanus*). I much regret not having any evidence as to the fertility of these eggs, but it is to be hoped that the coming season will bring to light many facts bearing on the subject to which this paper refers.

JOSEPH P. NUNN.

Royston.

P.S.—Since writing the foregoing, I have examined more clutches of sparrow-hawk and kestrel eggs, and found the 40 per cent. average fully maintained.

NOTES ON ECONOMIC BOTANY.

By J. T. RICHES.

RUTACEÆ (BUCHU).—This medicine consists of the leaves of several species of barosma, all obtained from the Cape of Good Hope, where they are collected by the Hottentots, often adulterated with other leaves, such as the leaves of *Adenandra uniflora* and species of *agathasmas*. But of course there is one or more species which are said to yield leaves of the greatest medicinal value, but as usually sold in shops they are a mixture of two or three species. The true officinal plant is *B. betulina*, *B. and W.* (*Diosma crenata*, *D. C.*). Decandalle applies this name, and this is figured by Stevenson

Fig. 24.—*Barosma serratifolia.*

Fig. 25.—Buchu Leaves. *a*, *Barosma graveolens*; *b*, *B. betulina* (*D. crenata*); *c*. *B. serratifolia*; *d*, *B. venusta*.

and Churchill as the true plant. The leaves are about three-quarters of an inch long, coriaceous, obovate, with a recurved truncated apex and sharp cartilaginous spreading teeth; flowers pink, terminating the branches. The leaves of chemists' shops are said to be the produce of this species, but are very obviously a mixture. Other species are collected, such as *B. crenulata*, Willd., figured in "Bot. Mag.," pl. 3413, vol. lxii., with leaves about one inch long, oval lanceolate, obtuse, minutely crenated, five-nerved, smooth, dark green above, paler beneath. This was thought by Sir W. Hooker to be the species to which preference is given, and *B. serratifolia*, Willd. (Fig. 24), (*Diosma serratifolia*, "Bot. Mag.," vol. xiii., pl. 456). Leaves 1 inch to 1½ inches long, linear, lanceolate, tapering at each end, sharply and finely serrated, three-nerved; flowers white upon short peduncles.

The leaves of all this species are marked with glandular dots, which is characteristic of the members of the Rue family. Some of the leaves have distinct glands at the crenatures; this is conspicuously the case in *B. crenulata*.

The properties of buchu are aromatic, tonic, stimulant, diuretic, &c. An infusion, or a tincture, is prepared from them, which is greatly praised as a remedy in chronic inflammations of the bladder, urethra, and in chronic rheumatism.

The Hottentots make a powder of the dried leaves, and, mixed with grease, use it for daubing the body; in fact, it forms a part of their toilet. They also use the leaves steeped in brandy for all sorts of complaints.

PRO GLORIA DEI: PRO UTILITATE HOMINUM.

By Dr. Alfred J. H. Crespi,

Examiner, Hon. Life Member and Lecturer, St. John Ambulance Association.

Although the advances of medicine and surgery have of late been rapid beyond precedent, and human suffering can now be relieved with a certainty undreamt of thirty years ago, and many diseases which till yesterday baffled the skill of the physician and were the despair of the surgeon now admit of easy and prompt cure, it is nevertheless more than ever true that the watchword of the scientific medical practitioner is and must ever be Prevention rather than Cure. To prevent is far easier than to relieve, and in consequence the suffering accompanying illness is entirely avoided. Unfortunately, the world does not fully enter into the spirit of modern medicine: it continues to regard illness and accident as coming one hardly knows why or whence, and to be dealt with, when they come, secundum artem, but not to be prevented. In truth, disease is the penalty of the infringement of nature's wise laws, and accidents, though not so obviously preventable, generally admit of their worst sting being removed. No medical man fails every year—almost every week—to see cases of suffering that have been aggravated, perhaps actually caused, by ignorance. The careless handling of an injured limb, and the not knowing how to remove lime from the eye, and to control hæmorrhage, cost life, limb, and sight every day, and in some part or other of the world, many times a day. The sufferer may command the most perfect medical skill, and may have kind nurses and every comfort and appliance, which wealth can purchase, but if the right kind of help is not given at the nick of time all may be of no avail, and the ablest surgeon and the most compassionate nurse can cheer and comfort but cannot save. Accidents are the commonest of occurrences. Two or three hours in a general hospital of the largest size make even the initiated shudder: the pressure is so continuous and severe, and a score of fresh cases frequently present themselves in a single day at every large hospital. If allowance is made for the many cases seen by private practitioners, and those escaping medical observation altogether, or not presenting themselves until irremediable injury has been done, a total so appalling is reached that the imagination is overwhelmed. A large Insurance Society states that one person in twelve meets with an accident every year. Nor are children exempt from accidents, but let us exclude them, and allow, roughly and incorrectly, that two-fifths of the population consists of young children, there remain 24,000,000 of persons among whom 2,000,000 accidents occur in a single year in the United Kingdom alone. In America accidents are as frequent, and other civilised countries show figures equally appalling. In a large majority of cases skilled assistance is not of special value at the moment of the injury, but in all instances the knowledge that that skill is possessed by bystanders, or by the sufferer, cheers and gives confidence. The assurance that the doctor will do everything that skill permits makes his arrival doubly welcome. The patient begins to mend as soon as he hears the familiar step and sees the sympathetic face. He feels that he is in safe hands and his mind is calmed. Why should not every man and woman have some acquaintance with the means which have been found most efficacious in emergencies? No tedious course of study is needed; and no special ability; although common-sense, unless guided by knowledge, is practically useless, and sometimes actually dangerous. It is just those energetic, matter-of-fact people, who feel that something ought to be done, but do not know what, who are the most likely to interfere and to aggravate suffering and cause incurable mischief.

It was precisely because the aims and methods of the St. John Ambulance Association were so imperfectly understood, and in many quarters so thoroughly misunderstood, that Lieut.-Col. Sir Herbert Perrott, Bart., the chief secretary, asked me some time ago to assist him with my pen to remove these misconceptions, and though my time is very greatly filled up in a variety of ways, independently of medical practice, I felt that I could not refuse to render the help he desired; and accordingly I have in the pages of the medical press and in those of several general magazines drawn attention to a subject which has urgent claims on every benevolent and humane person.

To give instruction that would be useful in rendering "First Aid to the Injured in Peace and

War" was the object which the founders of the St. John Ambulance Association in England and the Colonies and of the Samaritan Schools of Germany had in view. A decade has hardly passed, and what has been accomplished? At least 250,000 persons have, in the United Kingdom alone, obtained certificates of proficiency after a brief but satisfactory course of instruction, while in Germany successful students are numbered in scores of thousands. Nor is this all: in addition to instruction how to face accidents with fortitude, and some knowledge of what to do in emergencies, many pupils obtain an insight into the mysteries of the human frame, which impresses and astonishes them, and refines and elevates their thoughts.

The crass ignorance of even educated people often surprises doctors. Some years ago a clergyman—no, fool I can assure the reader—was in his garden, when his little boy disappeared in a pond, and was speedily fished out. "What did you do?" I asked. "Do," he replied, "why, what could I do, but roll him about the lawn till all the water had been got out of him." Popular superstitions are hydra-headed and not confined to any age or people. The Abu Simbul battle-piece is a case in point: it goes back to 1361 B.C., and represents a battle between the Egyptians, headed by Rameses, and the Syrians. In the course of a fiercely contested and uncertain engagement, in which victory at times inclines to one side, then to the other, the Syrians are at last put to flight, and the Prince of Aleppo falls into the Orontes, and is drowned. He is dragged out by his men, who on the opposite bank vainly endeavour to bring him to life again by holding him up by his feet and letting the water run out. How curious that on the wall of the Ramesium at Thebes and at Abu Simbul, a little to the north of that city, we should have representations, one of them 57 feet by 25, of the events connected with the battle of Kadesh, and that in this fashion we should know that the ancient Egyptian method of treating the drowned was the same in principle as that of a Clifton clergyman of our day.

How little we know about life. Why death follows certain injuries and not others; why men grow old and die; why some diseases fasten themselves on our frames we do not know—nay, we cannot even conjecture. But we do know that the human body is the most beautiful and complicated of all the structures of which we have any knowledge. The foundation of the full and accurate knowledge of our day is due to Italy, where the first medical school established in Europe was at Salermo in the seventh century; the second was probably at Montpelier, and was founded about a hundred years later. Of that primitive medical course nothing is now known. For a long time the practice of medicine was almost entirely confined to the clergy. The human body is intended to discharge many most difficult and conflicting functions. It works like the steam-engine, but, unlike that wonderful machine, repairs itself. It cannot even stop for a single five minutes throughout the whole of life—on it must go toiling continuously, and getting through an amount of work that seems enormously beyond its limited capacity; it requires a constant supply of fuel and consumes it more completely than any steam engine; it is adapted to do many things at the same time, any one of which might be discharged with perfect ease and great efficiency, but when twenty different things are done at once, then indeed the perfection of the machinery is seen to be almost too great for human comprehension. What of the lightness and strength of the human frame, of the protection, which the bony framework affords to delicate structures, and of the capacity for repairing injury? No young student can possibly comprehend these matters; it is only as years give experience, and the intellect strengthens and develops, that he begins to grasp, though always imperfectly, the surpassing beauty of the living machine. Fearfully and wonderfully made is inscribed on every part, and the beautiful thought of Tertullian is now better understood than when first uttered: "Man is made in the likeness of God; God in forming the first man took for pattern the future man Christ." A young curate told me, a few days ago, that he did not wonder that most doctors were Atheists—the horrors of the dissecting-room would undermine any one's faith. No doctor, he added, could feel real reverence for human life and the human body. Sad, indeed, if true; but, thank God! false from beginning to end, the foolish words of an ignorant teacher. From the contemplation of the wonders of the glorious body of man, with its bewildering functions, the thoughtful man rises overwhelmed with the majesty of God. "What is man, that Thou shouldest visit him? or the son of man, that Thou shouldest care for him?" must possess his mind during all his waking hours.

The labour and thought given to ambulance classes would be fully repaid had they done no more than lift the veil from those mysteries, and impart some knowledge respecting them. After listening to lectures on the human body from a master, the self-respect is increased, and we recognise that our body is indeed the temple of God committed to our care; that we are responsible for its safe keeping, and that it is well worthy to be the habitation of the mind and spirit. The human frame is, moreover, the highest embodiment of beauty; it represents the sublimest conceptions of the architect and the engineer; its lightness, economy of material, and surpassing strength are unapproached by anything that man has put together. Not in trees, hills, and lakes, did Raphael find his inspiration, but in depicting the saint, the mother, and the babe, and in reproducing the human form the Greek sculptors achieved their greatest triumphs. Need I say that, entered upon in a religious spirit, a course of ambulance instruction arouses feelings of deep reverence and increases delicacy. Instead of medical details, which are not necessarily coarse, being dwelt upon, and the mind being filled with suggestions of evil, the pupil should leave the lecture room awed and purified as he would from listening to the Messe Solennelle of Beethoven or the Messiah. The soul ascends to nature's God, the thoughts rise, and the nobler emotions are strengthened. The instruction also gives scope for the display on the part of the student of great ingenuity. Half-a-dozen lectures on astronomy, from the late Richard Proctor, that master of graphic description, familiarised the listener with wonderful details respecting the recognised queen of the exact sciences; the imagination was overpowered with glowing language, illimitable distances, boundless ages, and brilliant theories, but he was not taught to do something. Now it has been said that education, deserving to be so called, not only ought to teach us something worth knowing, but to do something; it should be practical, and ambulance instruction is pre-eminently that: it teaches us to help others and to aid ourselves, and shows us something we never before suspected, and which has been purchased with the best thought of hundreds of hard workers and thinkers. The course of instruction suggested by the Association consists of only five lectures, far too few to do justice to the matter, but they can be increased to seven or eight at the discretion of the local managers. The late Lady Brassey, an earnest and wise friend of the Association, suggested that, in some cases, two lectures a week might be given, so that the course would only cover three weeks. In this proposal she showed less than her usual judgment; but another suggestion of hers I can endorse—that there should be eight lectures. When a class is formed and a lecturer obtained—and the latter should always be a competent and experienced practitioner fairly familiar with platform work, for read lectures are an abomination—the course proper commences. I always suggest that before the technical lectures, a public lecture should be given, not necessarily by the instructor, on the scope of the work and its need, the books that should be read, and the examiner's requirements. When this has been got through, and the students gather together fairly well acquainted with what is before them, and with the importance of mastering it, the lecturer should describe the wonders of the human body, and if he is fully imbued with the spirit of his task—and unless he is, he should not attempt to teach—he will find, without entering into professional details, more than enough to fill many lectures. When this portion of the work is thoroughly done, the pupils are ready for the practical part, and unless thoroughly grounded, the rest of the instruction is dull and difficult of comprehension.

(*To be continued.*)

NOTES ON NEW BOOKS.

FIVE THOUSAND MILES IN A SLEDGE, by L. F. Gowing (London: Chatto and Windus). This is a vigorously written book by a well-known journalist. The author, and a friend who has since died, chiefly from the exposure and the hardships of the journey, undertook the perilous journey from Shanghai in China to Moscow, and that in the winter time and by sledging alone. It is, perhaps, one of the pluckiest journeys on record. The narrative never slacks in interest from beginning to end, and although the author has little or nothing to say about the physical geography, geology, botany, or natural history of the district, he has a keen eye for cities and towns, and the human life which pervades them. Some of his descriptions of the scenery through which he passed are graphically outlined; but the chief interest in the book lies in its going over some of the ground already familiar to us from the works of Dr. Lansdael and Mr. George Kennan. It is a genuine book of real travel, and one that cannot fail to be enjoyed by all classes of readers.

The Story of Chemistry, by H. W. Picton, B.Sc., with a preface by Sir Henry Roscoe (London: Isbister, Limited). The fact that the latter scientist franks this nicely got up book is a strong recommendation of its merits. It is not a handbook of modern chemistry, as some might imagine; and perhaps it would have been more correct to have called it the history rather than the story of that useful science. It is, in reality, the literary description of the evolution of one of the most useful sciences in the world, from its earliest empirical condition to the latest stages of chemical discovery. Thus we have described the period in the history of chemistry before the alchemists; next that of alchemical mysticism, followed by chapters on medieval mysticism, and another on the decline of this method of interpreting nature. Mr. Picton then devotes three chapters to the beginning of science: one to the childhood of truth; three to the conflict with error, and one chapter to the "Triumph of Truth." Next we come to the beginnings of modern chemistry, and we have four interesting chapters on the atomic theory. Lastly we have two chapters on the modern science of chemistry. The author splits up the history of chemistry into nine periods. We have seldom gone through a book with more enjoyment, and are, therefore, prepared to agree with the concluding lines of Sir Henry Roscoe's preface that the author has written just such a book as was needed.

The Scenery of the Heavens, by J. E. Gore (London: Roper and Drowley). Perhaps no science has, of late years, become more democratic than that of astronomy. When it could only be studied by the aid of telescopes that cost thousands of pounds, its pursuit was a rich man's luxury. This is all changed, for amongst the batch of books before us is one entitled: "Astronomy with an Opera Glass." Thanks to the popular and picturesque descriptions of Dr. Dick, Professor Mitchell, Dr. Lardner, and R. A. Proctor, astronomical knowledge is no longer the possession of a privileged few. The Royal Astronomical Society of London is one of our oldest scientific societies, and its fellows regarded it almost as a liberty that was taken when the town of Liverpool set up an Astronomical Society of its own. But that society has produced Mr. Roberts, whose famous stellar photographs are just now the admiration of the scientific world. We hope that ere long every city and town in the kingdom will have an astronomical society of its own. The author of the present book, Mr. Gore, has already earned a high reputation as a writer on astronomical subjects. This reputation will be more than sustained by the present volume, which gives us a popular and exact description of the most interesting facts relating to planets, comets, meteors, fixed stars, and nebulæ in terms free from mathematical formulæ and in language intelligible to the general reader. Two highly interesting chapters are those on the Astronomy of the Poets, by the author, and that on Fireballs, Shooting Stars, and Meteorites, contributed by the well-known astronomer, Mr. W. F. Denning. The work is illustrated by a considerable number of stellar photographs and other drawings.

Occasional Thoughts of an Astronomer on Nature and Revelation, by Rev. C. Pritchard (London: John Murray). Anything from Professor Pritchard's pen is sure to be received with thankfulness all round. This volume is in reality a series of discourses which he has given at various times and in divers places to the British Association, the Church Congress, as well as to the followers of Mr. Bradlaugh. The chapters are as follows: "The Continuity of the Schemes of Nature and Revelation," "The Analogy of Intellectual Progress to Religious Growth," "The Testimony of Science to the Continuity of the Divine Forethought for Man," "Modern Science and Natural Religion," "Aspects of Nature in Relation to Miracles and Providence," "Scepticism and Faith considered in their Relations to the Progress of the Knowledge of Nature," "The Slowness of the Creative Progress," "Difficulties of Belief," "The Miracle in Joshua at the Battle of Beth-Horon," "The Star of the Magi," "The Creation Poem of Genesis." The book is distinguished by a fine and delicate fibre of originality and thoughtfulness, and is also very delightfully written.

The Southern Skies, by R. A. Proctor (London: W. H. Allen & Co). This is one of the late Mr. Proctor's latest bits of work. It is a guide to the constellations of the Southern Hemisphere, and consists of a series of twelve maps, one for each month, so that it is true for every year. The positions of the principal star groups night after night are shown. There is a very intelligible Introduction to the work, and each map is accompanied by a separate explanation. All the maps are remarkably well executed, and by their aid it is utterly impossible for a student of the southern skies to mistake any star, cluster of stars or constellations.

An Illustrated Manual of British Birds, by Howard Saunders (London: Gurney & Jackson). This splendidly illustrated work, by one of the best known and most trustworthy ornithologists of the day, and which has been coming out in shilling monthly parts, has now reached the twentieth and final number. Young students of British bird-life could have no better work placed in their hands. The woodcuts are in the very highest style of woodcutting art. An important feature we have not hitherto noticed, is the bird charts, showing the geographical distribution and wanderings of all our British kinds.

A NEW PRESSURELESS MOUNTING-CLIP.

I NOTICED Mr. Bryan's note in the December number of SCIENCE-GOSSIP, suggesting a new form of mounting-clip designed to hold the cover-glass without pressure, thus being a great improvement on the spring-clip commonly used; and as I have devised one which I think has some advantages over his, I enclose you a sketch of it, thinking it may interest some of your readers. Fig. 26 A is an

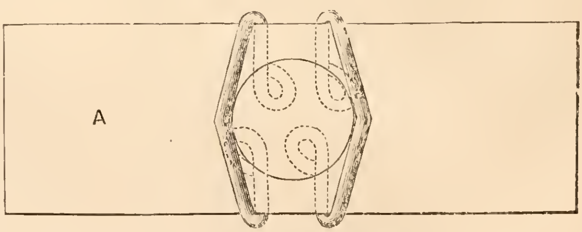
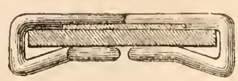


Fig. 26.—Clip on slide.



B

Fig. 27.—Section of Clip.

illustration of the clip in use as seen from above, and Fig. 27 B is an end view of the same as seen from a section through the cover-glass. The clip should be made of rather stout springy wire, so as to grasp the slide firmly. This clip will be less liable to shift or become detached from the slide; and it has the advantage of being suitable for rectangular as well as circular cover-glasses.

S. PACE.

MICRO-PHOTOGRAPHY.

THE rough sketch represents a home-made arrangement I have been using lately with success for micro-photography with an ordinary quarter-plate camera.

A wooden table is made a quarter of an inch wider round the top than the front of the camera—through the centre of which a hole is cut that will easily take the tube of the microscope. The lens is removed from the camera, which is then placed front down on top of the table; the microscope is placed underneath, with the eyepiece pointed into the camera through the hole in the table as represented in the figure. The light is prevented from penetrating the camera by means of a small silk sleeve (a) on to the tube. A good lamp is to be used for illuminating. Focus roughly by hand, and then finely on to the ground glass of the camera, by means of the fine adjustment screw (B); use a large diaphragm on the microscope base. Expose, etc., in the ordinary way. A little practice will soon show the right exposure to be given, always using the same lamp. A small beading round the top of the table holds the camera firmly.

David Wilson Barker.

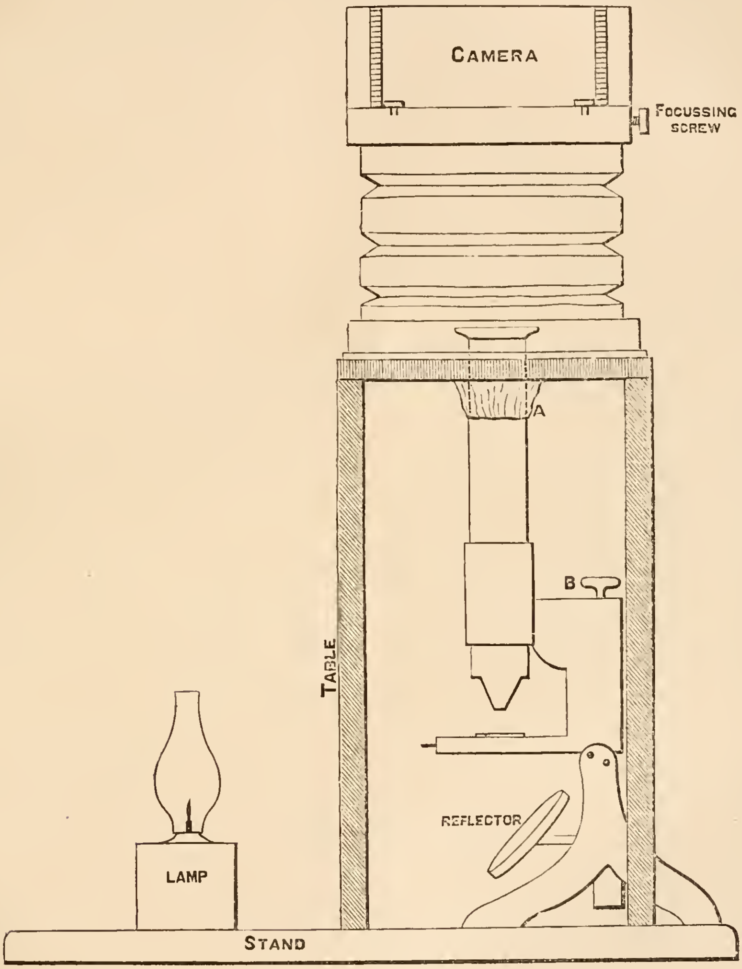


Fig. 28.

A MUD-CAPPED DYKE.

By the Rev. Hilderic Friend, F.L.S.

[*Continued from p.* 18.]

LET us now proceed to examine the dyke itself. In so doing we shall give the cap our earliest attention, and then inspect the stones.

II. The Dyke.—Here it stands, as a defence against the intrusion of bipeds and quadrupeds, and as a means of keeping cattle within their proper limits. To the eye, this "staen dyke" is anything but pleasing; it is often in ruins or decay, and if not skilfully built at the first will give the farmer no end of trouble, and afford a freaksome group of children or a mischief-working lounger plenty of amusement as they push stone after stone from its place into the field below. How then can the stones be secured in position so that weather and other agents may do the dyke as little damage as possible? Either some stones may be placed on edge as a coping, or a cap of mud may be placed on the top of the wall, and beaten down into a compact tapering shield.

In the case of the dyke now in our minds, the latter plan has been adopted. It may be objected, however, that to use any ordinary mud or wet mould for this purpose would be to call in a very unreliable material. Exactly so; and the rule is, that when such material only is available, turf is added, on account of the tenacity of the grass roots and fibres; and thus, while the wall is often bare and dry, the cap is covered with verdant grass or a variety of flowering and cryptogamous plants. Nature, however, seems to be always making everything ready for our hand, and it so happens that in many places where the boulders necessary for forming dykes are plentiful, a special kind of mud, called clay, is also found in the neighbourhood, which is admirably adapted for the purposes of coping the wall. Just as coal, iron, and fire-clay are often found together, or in near proximity, so boulders for building, and clay for coping attend each other. Has the one anything to do with the other then—did the same agency which placed the boulders where they are ready for the dyker also place the clay in position for his use as well? Undoubtedly! And here it is that, on this dull day in mid-winter, we are able to find something to instruct and interest us. We observe that this wall is capped with clay, which, having been properly beaten into shape, has hardened and formed an enduring cap, on which the rains and snows may fall for many winters before the tenacious mud will be worn away. We are thus led to ask: What is this clay, and whence came it? It is very different from the mould in the adjoining field which has been produced *in situ* (either in part or wholly) by the agency of rain and frost, by the burrowings of earthworms, and by a series of other changes on which I need not dwell.* It is also a very different thing from the clay which ages ago formed those slates which are quarried in other parts of this county of Cumberland (see *Fragments of Science*, by Tyndall, explaining what slates are); and equally different from those other kinds of mud or clay which we find in various parts of the country and in various geological formations (as London clay, lias, firebrick-clay, pipe-clay, terra-cotta clay, not to mention others). Like them, it is mud; like them, it consists of the finely-ground portions of earlier formations; like them, it has been subjected to the action of water; but, unlike most other clays, this particular kind has been associated with a force which has been at work, not in tropical seas, rivers, or estuaries, nor in temperate climes, but among the ice-bound regions of the north. What if we say that these boulders and that clay are really portions of the same rocks, and assert that they came from the same formations or the same mountain heights? True, the clay seems tolerably homogeneous, while the boulders, as we shall presently see, are heterogeneous; but then, if the clay be analysed, it will be found to contain nothing which cannot be found in the boulders as well; and we are perfectly well aware that the only real difference between the clay and the boulders is a difference of size. The clay has been rubbed down into a powder, and deposited while wet in such a way as to form a bed, while the larger masses have so far escaped the rolling and tumbling necessary to reduce them to an impalpable dust. The clay we are examining has received the very appropriate name of "Boulder-clay," on account of the presence in it of these larger masses or boulders; and geologists have now settled for ever the question of its origin. So much has been written by various authors, from Professor Geikie (*The Great Ice Age*) downwards, that no one need now be told how the boulder-clay came into existence.* So far as I am aware, the boulder-clay is not found south of the metropolis, and even where it does occur it varies greatly in colour and character. It abounds in Cumberland, and has been the subject of careful investigation on the part of a few devoted students, whose conclusions have been made public in "The Transactions of the Cumberland and Westmoreland Association" (particularly 1877 and 1887).

Mr. Goodchild especially has done good service in this direction by the publication of his paper on *Ice-work in Edenside*. When the mighty glaciers of olden time came sliding down the mountain valleys of Northern Britain they brought with them the materials which they had torn from the hill-sides and mountain-peaks; and while much of this was ground to powder, and presently emerged from the bottom of the glacier (in the stream which resulted from the melting ice) to be carried into the sea, the boulders, marked and striated, retained their position in the ice-mass till the ocean-waters caused the cold grip to be unloosened, whereupon they dropped into the clay which had already been deposited by the stream; and thus boulders and clay became for ever after associated with each other and with the glacial epoch.

Simple as this episode now appears, and interesting as the mud-cap upon our roadside dyke becomes by the light thus thrown upon it, the boulders of which

---

* Those who wish to pursue this subject further should consult Darwin's "Formation of Vegetable Mould," and Charles Kingsley's "Town Geology," chap. i.

* We may, however, refer our readers to "Town Geology," chap. ii., "Elements of Geology" (Lyell), chap. xi., "Reports of British Association," 1887 and other years, "Climate and Time," by Dr. Croll, and other works.

the wall is composed have perhaps a still more wonderful tale to tell. So far as my memory serves me, the boulders we find in North Notts (where the New Red predominates, as it does in North Cumberland) are almost entirely quartzite; and when one has overhauled a few heaps of boulders by the roadside, a strange and melancholy monotony is found to prevail among them. Not so in Cumberland, however, for every new wall and every fresh heap of boulders examined reveals something unseen before until the examination has been proceeded with for a considerable time. Quartzite-pebbles are here, it is true, but then we find a multitude of other forms as well, to relieve the monotony and introduce some new cause for wonder and surprise. Here it is a "cobble," there a piece of well-marked grey or red granite, here a piece of mountain-limestone, and there some lumps of crumbling sandstone; and these, from various points of the compass, jumbled together in hopeless confusion! What can be the meaning of it all?

It must be observed in the first place that the general trend of the glaciers was from the northward, though not necessarily due north and south. The physical geography of the district traversed by the glaciers would have a more or less material influence on their local movements; but we do not know of any glacier originating in the south and moving northwards. Hence we shall find, *as a rule*, that the boulders can be traced from a more northerly district than that in which they are found imbedded in the boulder-clay. Thus the pebbles found around Liverpool in the glacial deposits have been clearly traced, by the geological surveyor employed by Government, to the mountains of the Lake District, sixty or seventy miles away to the north ("Town Geology," chap. ii., p. 41). I say "as a rule," for in Cumberland we are obliged to face the fact that boulders are found many miles north of their home; and this would seem at first sight to indicate that the glaciers had originated in the south. What the real explanation is may be best seen by the charts and papers published in the "Transactions of the Cumberland and Westmoreland Association, especially vol. v. (1879-80), p. 151, *et seq.*; vol. vii. (1881-82). Quartz, felsite pebbles from Helvellyn and St. John's Vale, are mixed up with the grey granite of cloud-capped Criffel which stands on the opposite side of the Solway overlooking Silloth and Maryport, and the green basaltic rock, known locally as "cobbles," is abundantly represented in the boulders. We are brought face to face with stones which have had an igneous origin, and have been poured out of the bowels of the earth in form of lava, just as is done to-day by Vesuvius and other active volcanoes; next we meet with limestone-blocks full of animal remains, and anon we are face to face with corals, and early coal measures or later Permians in the shape of shales or sandstone. The fine even texture of this block tells us that it was once like water, and that the denser matter which came with it from the bowels of the earth had fallen by its own weight lower down in the stream of lava which ages ago came belching forth from some British volcano. This boulder next it beautifully displays the processes of crystallisation which have been going on in past millenniums; that pebble speaks of seas in which curious monsters of the deep could disport themselves, till death caused them to add their abodes to the mass of calcareous matter which was forming the future mountain-limestone at the bottom of the abyss. And not to be too prolix, this piece of red rock tells of quartz rolled and ground and polished into tiny grains under the action of wind and water, coated with peroxide of iron, and curiously changed in the course of ages into the new red sandstone, which we now see from Dumfries to Penrith, and through many parts of Yorkshire, Lancashire, Cheshire, Northamptonshire, and even as far south as Bristol and Torquay. If we can read between the lines we are able to see in this mud-capped dyke, as the antiquary sees in a musty manuscript, or the philologist in a number of old words, a history of surpassing interest and charm. We can go back to the early periods of the earth's history, when it was intensely hot in these northern latitudes, then gradually travel along the highway of time till the great ice age (or ages) came; and having seen the effects of frost and ice, and inquired into the cause of this immense change, we watch the rolling back of the glaciers again under the influence of returning heat, till we come down to the age when the climate was of a more rational type, and man began to take his part in the great play of life.

Carlisle.

POND LIFE IN THE PARKS.

IN looking over my list of "finds" for the last three years, I have been much surprised at the number and variety of forms found, certainly much more than I should have fancied would have existed, speaking comparatively, in the ornamental water of our public parks; in this account, of course, I am alluding to Birmingham only. I have been pleased to chronicle the finding of some extremely good things, especially in the Rotiferæ and Infusoria. I mention this because it may be the means of saving some of our friends a long journey sometimes, when they might, for all they know, find the object sought after close to their own doors, so to speak, and very near as convenient as turning on the tap and getting one's pond life in that way. If I remember right, our pond-hunting friends did do so some time ago, and got some extremely choice things through the medium of the town water supply; and now, as our chief local pond-hunting resort gets worse and worse every year, viz. Sutton Park, our friends may well and profitably examine the waters above alluded to, especially if some of our influential local naturalists would kindly use their influence with the Baths and Parks Committee, and get them to let the anacharis and nitella alone, and not rake every particle of vegetation out, like I see they are now doing at Sutton Park pools (of course, I mean a reasonable amount of plants left in), not to quite exterminate the plants, as I think they give the pools a more

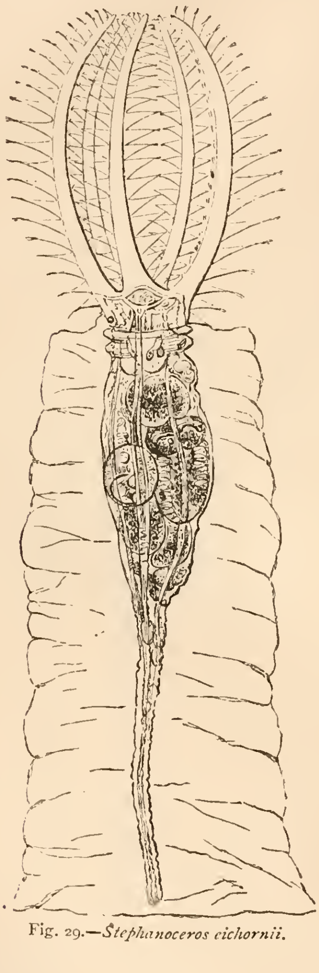


Fig. 29.—*Stephanoceros eichornii.*

natural appearance. There seems to be a disposition on the part of some people to convert the lovely park at Sutton to the conditions of a gigantic tea-garden, and the exquisite lakes to Corporation Bathing Places. I trust this will never be the case. I think something of this has been done, or tried, in some part of Epping Forest; however, Epping has more room than Sutton, and Birmingham naturalists, I feel sure, would be with me in this matter, both botanists and lovers of all the exquisite beautiful forms found in the lakes and ditches would never consent to an artificial condition like I have spoken of. Nature unadorned is adorned the most from the view of a true naturalist, and, as I know well enough how much SCIENCE-GOSSIP is read in the Midlands, I hope plenty will see after this matter and join issue on it. In Sutton Park there are all the elements favourable for the development of one of our most exquisite class of algæ, namely, the plants called desmids. There they alone flourish in all their beauty; and nowhere else for many miles from our city can a student find such charming form and variety as at Sutton Park, and I find scarcely any of these class of plants in the parks (this is Sutton's chief character); only in the far-off bogs and sphagnum swamps of North Wales and the Lake districts can any one expect anything of importance in this class.

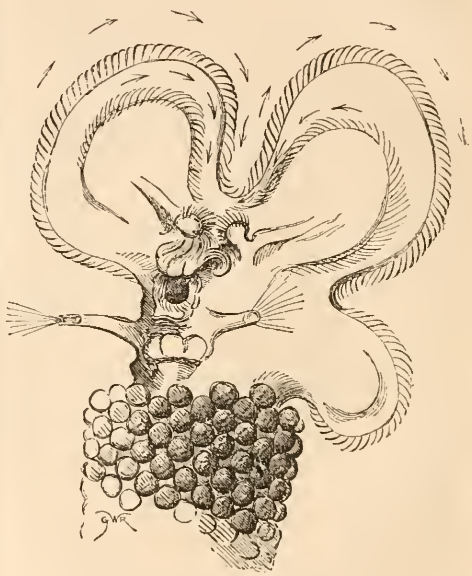


Fig. 30.—*Melicerta ringens.*

I have here now only just to dip my ring-net twice or thrice through the mass of *Sphagnum cymbifolium*, when I could secure variety to my heart's delight—micrasterias, peniums, xanthidiums, cosmariums, spirotenias, closteriums, and others in abundance; and now, if the powers at Sutton set to work some day or other and put the park through a thorough course of drainage, all this charming class of plants will be improved off the face of the park, not, of course, to speak of thousands of other forms, including animal life—the rotifera, polyzoa, infusoria, and the filamentous forms of algæ. So, if the worst comes to be the case, all I hope is, that our parks won't be allowed to follow suit in this matter, for I have been extremely thankful to them many a time for being so convenient.

Now in the undermentioned list, I must add, are only those forms enumerated which I could fully identify; there are very many forms which I could not satisfy myself, especially the diatoms.

ROTIFERÆ.

Stephanoceros Eichornii.
Melicerta ringens.
Floscularia ornata.
,, regalis.
Cephalosiphon limnias.
Limnias ceratophylli.
Rotifer vulgaris.
Pterodina patina.
Noteus quadricornis.
Monura dulcis.
Philodina roseola.
Distemna forficula.
Tardigrada (macrobiotus).
Chotonotus larus.
Brachionus amphiceros.
Dinocharis pocillum.
Eosphora aurita.
Œcistes crystallinus.

INFUSORIA.—*Continued.*

Trachelius ovum.
Coleps hirtus.
Parameciun bursaria.
Loxophyllum.
Peridinum tabulatum.
Thuricola valvata.
Platycola decumbens.
Anthophyra vegetans.
Euglena spirogyra.
Cladonema laxa.
Dendromonas virgaria.
Euglena acus.
Amblyopsis viridis.
Choano flagellata, viz.:
Codosiga umbellata
,, botritis
Monosiga ovata
,, gracilis } Kent.
Vorticella nebulifera.
,, pattelina.
,, campanulata.
,, microstoma.
,, microscopica.
Epistylis flavicans.
,, var. decumbens.
,, anastatica.

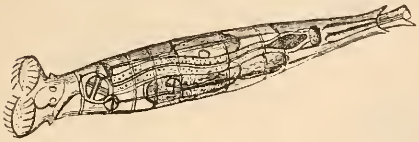


Fig. 31.—*Rotifer vulgaris.*

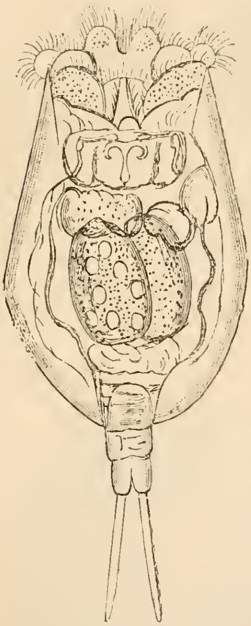


Fig. 32.—*Euchalanis.*

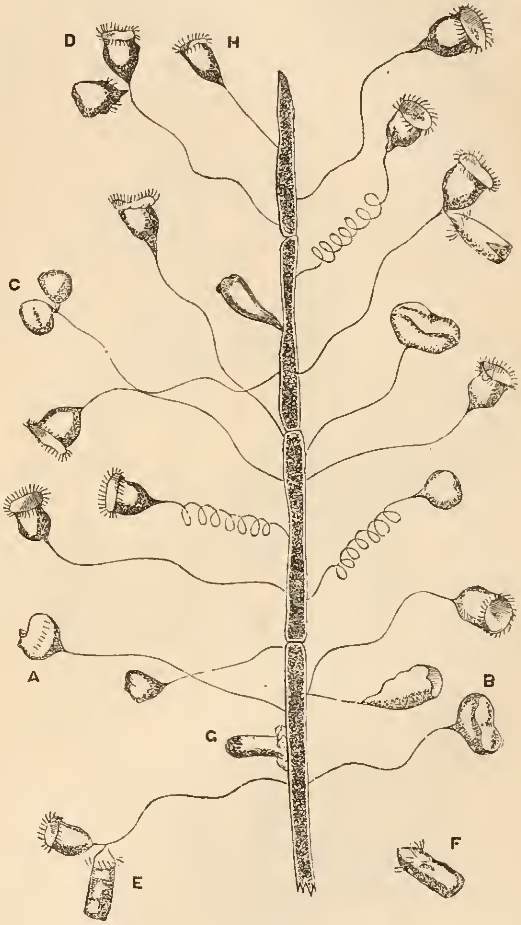


Fig. 33.—*Vorticella nebulifera.*

Euchlanis dilatata.
Mastigocerca carinata.
Dinocharis tetractis.
Synchæta tremula.
Brachionus pala.
Diglena lacustris.
Ptgura melicerta.
Rattulus lunaris.

RHIZOPODÆ.

Amœba radiosa.
,, princeps.
,, villosa.
Arcella dentata.
,, vulgaris.
Difflugia pyriformis.
Difflugia urceollata.
,, spiralis.
Euglypha alveolata.
Centropyxis aculeata.
Actinosphærum Eichornii.
Actinophrys viridis.

INFUSORIA.

Ophrydium sessile.
Synura uvella.
Rhaphidiophrys semen.
Trachelomonas hispida.
Dendrosoma radians.
Stentor cœrulias.
Dinobryon sertularia.
Nassula ornata.
Folliculina Boltoni (rare).
Uroglena volvox.
Phacus triqueter.
,, pyrum.
Stentor polymorphus.
Opercularia nutans.
,, articulata.
Acineta myrtacina.
Carchesium polypinum, and others.

ALGÆ.

Closterium acerosum.
,, strialatum.
,, intermedium.
,, lunula.
,, Dianæ.
Cosmarium botrytis.
,, tetraophthalmum.
Zygnema cruciatum.
,, pectinatum.
Spirogyra porticalis.
,, nitida.
Pediastrum Ehrenbergii.
Mesrismopedia glauca.
Raphidium falcatum.
Scenedesmus quadricada.
Gonium pectorale.
Clathrocystis æruginosa.
Prasiola crispa.
Chætophora endivifolia.
Scenedesmus acutus.
Coleochæte scutata.
Aphanotheca hystrix.

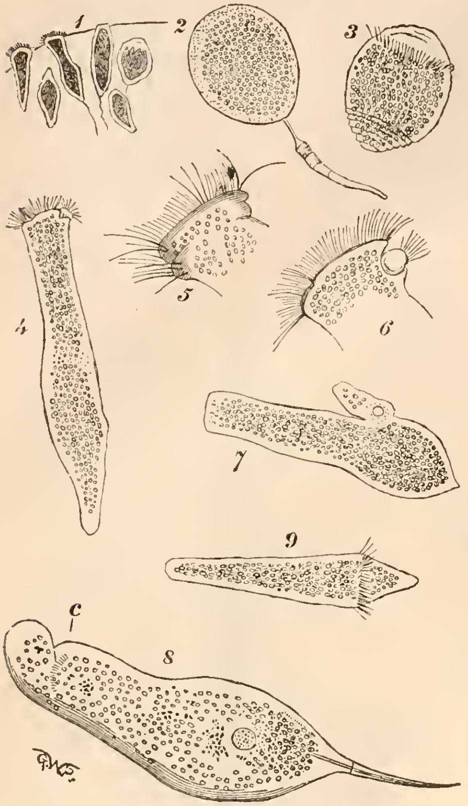


Fig. 34.—*Ophyridium versatile.* 1, Group in gelatinous envelope; 2, 3 and 4, separate individuals in different conditions; 5 and 6, head magnified; 7, young animalcule produced by gemmation; 9, swimming animalcule.

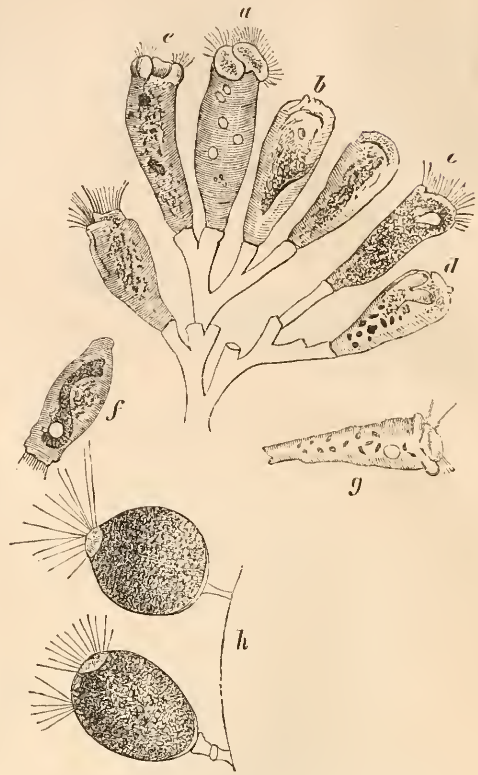


Fig. 35.—Various stages in development of Epistylis from *a* to *h*.

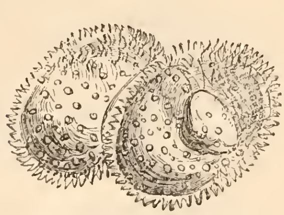


Fig. 36.—*Cosmarium margaritiferum.*

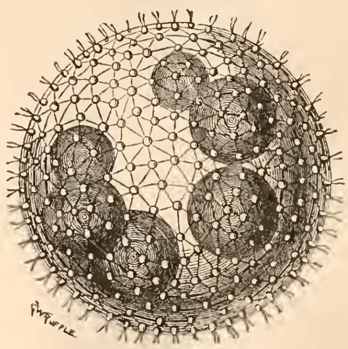


Fig. 37.—*Volvox glob itor.*

Fig. 38.—*Closterium strialatum.*

ALGÆ.—*Continued.*

Spirogyra condensata.
Volvox globator, and abundant.
Bulbochæte setigera.
Ophiocytium cochleare.
Microspora floccosa, &c.

DIATOMS.

Pinnularia viridis.
,, nobilis.
,, major.
Pleurosigma acuminatum.
,, tenuissima.
,, attenuatum.
Navicula rhomboides.
,, serians.
,, amphisbœna.
Synedra radians.
Cymatopleura solea.
Nitzschia sigmoides.
Surirella bifrons.
Asterionella formosa.
Amphora minutissima.
Encyonema prostratum.
Fragillaria capucina.
Diatoma vulgaris.
Diadesmis confervacea.
Himantidium pectinale.
Gonphonema acuminatum.
Navicula cuispidata.
Cocconema lanceolatum, &c.

I may also add for plants, *Nitella translucens*, anacharis, myriophyllum, and *Ranunculus aquatilis*. There was in one pool many specimens of that curious flask-shaped caddis case of the *Oxythira costalis*, supposed to be rare.

E. H. W.

Birmingham.

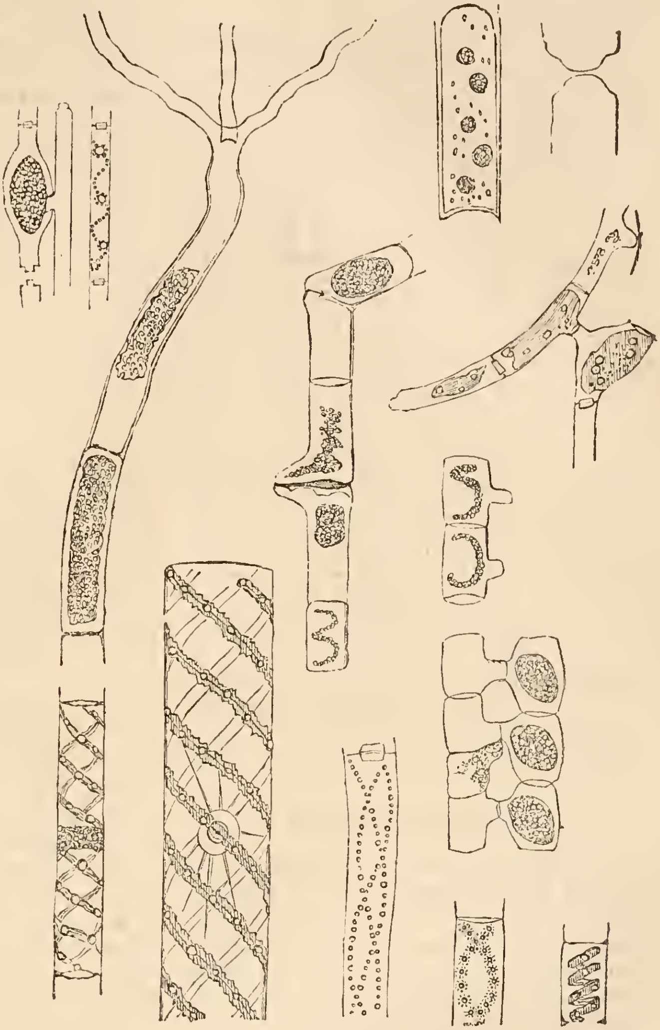


Fig. 39.—Various stages of Spirogyra.

ASTRONOMY.

By JOHN BROWNING, F.R.A.S.

I HAVE with great regret received a copy of the last Dun Echt Circular from the Observatory of Lord Crawford. These circulars have been issued from the Dun Echt Observatory for a series of years, and have given the earliest information obtainable of the advent or position of comets and many other astronomical phenomena. These circulars have frequently been very valuable. The Observatory of Dun Echt has now been closed, and Lord Crawford has presented his most costly instruments to the Royal Observatory, Edinburgh, so that, henceforth, they will be the property of the nation.

Lord Crawford has expended a sum of money on astronomical instruments and astronomical expeditions that many would consider a fair fortune. On one of these expeditions he had a severe attack of fever, and for years he had recurrent attacks season after season.

The exquisitely modest terms of the last Dun Echt circular would give no idea of Lord Crawford's great services to astronomical science for which not only astronomers but the nation is indebted to him.

Dr. Otto August Rosenberger, who has been Professor of Astronomy at Hull for nearly sixty years, is dead. He had been an Associate of our own Royal Astronomical Society for more than fifty years.

The account has been published of Professor Tacchini's observations of solar phenomena at the Collegio Romano.

Sun-spots have increased both in number and frequency during the last quarter of 1889, and the number and height of the solar prominences has increased also.

On March 20 the sun enters Aries. Spring commences at 4 aft.

In March, Mercury is a morning star during the first half of the month.

Venus is an evening star in the latter part of the month.

Mars is a morning star.

Jupiter is a morning star.

There will be no occultations or astronomical phenomena of especial popular interest in March.

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for March.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	5	5 59M	19 38M	3 17A
	12	5 55M	10 49M	3 43A
	19	5 50M	11 4M	4 18A
	26	5 42M	11 20M	4 58A
Venus ♀	5	6 54M	0 28A	6 2A
	12	6 41M	0 32A	6 23A
	19	6 26M	0 36A	6 46A
	26	6 12M	0 40A	7 8A
Mars ♂	5	0 47M	5 5M	9 27M
	12	0 35M	4 51M	9 7M
	19	0 22M	4 34M	8 46M
	26	0 6M	4 15M	8 24M
Jupiter ♃	5	5 9M	9 25M	1 41A
	12	4 46M	9 4M	1 22A
	19	4 21M	8 41M	1 1A
	26	3 58M	8 19M	0 40A
Saturn ♄	5	4 0A	11 14A	6 32M
	12	3 29A	10 44A	6 3M
	19	3 0A	10 15A	5 34M
	26	2 30A	9 46A	5 6M

SCIENCE-GOSSIP.

The origin of the diamonds in South Africa has just been discussed before the French Academy of Sciences. It was argued that the South African diamonds were not formed *in situ*, but were emptied from great depth, together with the fragmentary materials in which they are embedded. The presence of the diamond in its natural state, and as Carbonado as well as transformed from graphite in various stages of meteorites, is now placed beyond doubt. Attention was called to the analogous conditions of association under which this crystal occurs in South Africa and also in meteorites. M. Daubrée is of opinion that the diamond is not (as is generally supposed) of vegetable origin, but is of inorganic nature, as is also the graphite found in the same rocks. This will be a new idea for many geologists.

The distinguished astronomer, Professor Schiaparelli, has been diligently studying the rotation of the planet Mercury for nine years past, and has just published the results of his observations. He shows that Mercury revolves round the sun in the same manner as the moon revolves around the earth, always presenting to it the same face. Hence as the period-time of Mercury is nearly eighty-eight days, this must be the time of rotation on its axis.

Some few months ago we heard a good deal about a certain so-called "weather plant" (*Abrus precatorius*), introduced by Herr Nowack to public notice. It was claimed for this wonderful organism that it would not only foretell weather changes, but also approaching earthquakes. The plant was not left without a trial at the Kew Meteorological Observatory, and the results of careful observations made on it are recorded in the last Bulletin. We hardly need say that its supposed virtues are perfectly fictitious. Perhaps we should not have taken any notice of them in England if the Prince of Wales had not interested himself in botany so far as to request the authorities to record observations on the plant. It is a highly sensitive-leaved plant, but that does not make it either a weather prophet or a dreamer of seismological dreams.

Mr. W. E. Collinge, who is preparing for publication an account of the "Land and Freshwater Mollusca of Oxfordshire," would be pleased to receive copies of local lists, records, &c., from those interested or having such.

At the Annual General Meeting of the Geologists' Association, on Friday, February 7th, the President, Mr. T. V. Holmes, delivered an address entitled, "Notes on the Nature of the Geological Record."

The Quekett Microscopical Club, owing to increase of members and the inadequate accommodation at their old rooms at University College, have secured rooms at the new premises of the Royal Medical and Chirurgical.

MM. Tempère and Peragallo, of 168 Rue Saint-Antoine, Paris, are bringing out some very interesting series of mounted diatoms from all parts of the world, recent and fossil. The value of such collections cannot well be overrated. The prices asked are very moderate, a series of twenty-five costing the same number of francs.

We have received from Mr. J. C. Thompson a most interesting and comprehensive paper by himself on the "Types of Metamorphosis in the Crustacea." This formed his presidential address before the Liverpool Microscopical Society, and is reprinted from "Research." The paper is amplified by a series of excellent illustrations.

Mr. J. W. Williams sends us a copy of his paper on "A Tumour in the Freshwater Mussel," reprinted from the "Journal of Anatomy and Pathology." It will doubtless be greatly appreciated by those interested in the pathology of the mollusca.

The Selborne Society is bringing out a new issue of its magazine, under the title of "Nature Notes."

We are always changing old lamps for new, but the new are not always improvements on their predecessors. The latest thing in photography comes from Mr. W. J. Harrison, a well-known geologist and antiquary, who has projected a photographic survey of Warwickshire. The scheme is very elaborately detailed, and is to include a topographical, zoological, botanical, and geological survey of the county by means of photography. We are evidently on the lines of departure of a new system of geographical exploration. The degree to which amateur photography and photo-micrography are extending in this country is perfectly wonderful. A camera is now as necessary to a gentleman's complete equipment as a gold-headed cane was to our grandfathers.

Mr. Isaac Roberts of Liverpool, the distinguished amateur astronomer, read a paper before the Royal Society on a "Photographic Method for Determining Variability in Stars." He showed that photography could be better trusted than the human eye, and he explained his method by which any errors caused by atmospheric, actinic, or chemical changes are eliminated, so that the study of stellar variability can now be pursued under conditions which admit of all necessary exactitude. Mr. Roberts' method is to give two or more exposures of the same photographic plate to a given sky space, with intervals of days or weeks between each exposure.

Mr. Brundenell Carter has recently read a most valuable paper on "Vision-testing for Practical Purposes." It has been proved that out of 125,127 persons examined, the percentage of those who were colour-blind was 3·95. Mr. Carter strongly condemns the methods of testing for colour-blindness employed on our English railways, and also by the Board of Trade, declaring it to be not only quite wrong, but the offspring of ignorance and presumption, the very existence of which, he says, would be incredible if the proofs of it were not daily brought under our observation.

Baron Nordenskiold, the intrepid and distinguished Arctic traveller and naturalist, whose performance of the discovery of the north-east passage in the "Vega" a few years ago is so well known, has announced to the Swedish Academy of Sciences, that he and another scientific *confrère* intend to start early next year on an expedition to the South Polar regions. They announced that they are being assisted in their contemplated work by the Australian colonies.

A German scientist professes to have discovered that electric currents are set up in the skin by mental excitement. These can be detected by a delicate galvanometer. Tickling sets up these microscopical currents; so does the sudden impact of hot or cold water; a needle prick, etc. Sound, light, taste, and even smell will produce them. Nay, even the indulgence of strong imagination can be thus detected. It is a kind of electrical "thought reading." Mental work will produce currents varying with the amount. Thus the mental labour of a simple arithmetical sum hardly shows any current, whilst the labouring out of a mathematical problem sets them up intensely. If a person is in a state of intense expectation, the mirror attached to the galvanometer is in a state active oscillation. The strength of these electric currents of the skin appears to depend on the degree to which the part of the skin bearing the electrodes is furnished with sweat-glands. Thus some parts of the back, and of the upper leg and arm (which possess comparatively few sweat-glands) hardly produce any current. The scientist above referred to considers that every kind of nerve activity is accompanied by increased action of the glands of the skin. It is already known that every nerve function, causes a change of temperature, and also the accumulation of the products of exchange of material in the body. Increase of sweat production helps to get rid of such products.

The last new tip from South America, is the discovery of a plant in the United States of Columbia called *Coriaria thymifolia*, whose juices supply a ready made ink, which is at first of a reddish brown colour, but afterwards turns black. On this account it has been called the "ink plant."

MICROSCOPY.

Philodina macrostyla, Ehr. (= *P. tuberculata*, Gosse).—The dictum that all the known British species of Bdelloida have three toes, which Dr. Barnett Burns quotes, is not Gosse's, but Dr. Hudson's, not being in brackets (see "The Rotifera," vol. i. p. 95, n. 2). But it is true that there is a statement to the same effect as to the genus Rotifer in Gosse's description of Actinurus. In October, 1886, I received a letter from Mr. Gosse, containing some information about this species, with a drawing of the termination of the foot. In this drawing only three toes are shown, but it is possible that one of the inner toes may be hidden by one of the outer. Mr. Gosse says, "the toes proper are very seldom protruded." He states that the species sometimes "occurs quite smooth, transparent, and colourless," and then proceeds to describe the condition figured in the Supplement. He adds that the form of the spurs is very characteristic of the species. The characters (or some of the characters) of *P. macrostyla* were given in Pritchard's "Infusoria" as long ago as 1845. Nothing is said as to the number of toes in Pritchard's "Infusoria" (ed. 1845).—*J. W. Blagg.*

New Boxes for Slides.—Mr. E. Mosely, of Hastings, sends us one of his cleverly-constructed new boxes for slides. The advantages will be apparent from the annexed figure (Fig. 40). By pulling out the bottom drawer the others come out just far enough to show the labels on the slides; thus it will be at once noticed if any one slide is missing. It well deserves the name bestowed on it by its inventor, namely, "Compacta," for it is the most compact slide-box that we have seen, and is so simple that it cannot easily get out of order. We heartily recommend it to those in want of a good microscopic slide-box.

ZOOLOGY.

Shells from the North West London District.—The shells of *Planorbis corneus* from the Leg of Mutton Pond, Hampstead, are of a *rusty* red color, not "*ruby*" red, as appears on page 259, line 22, through a printer's error.—*C. C. Fyer.*

Mimicry and Protective Colouring among Land and Fresh-water Shells.—I should be glad if some of your numerous correspondents would kindly furnish any information, or refer me to published papers on the above subject.—*C. Clare Fyer*, 139 *Fellows Road*, *South Hampstead*, *N. W.*

Land Mollusca," a paper which might be regarded as a continuation and amplification of the views which the same author had expressed in a former paper, published in the Society's Journal last year.

The Rudimentary Intelligence of Infusoria.—I do not think that I, even by implication, stated the present infusorial instinct to be the outcome of reasoning on the part of some ancestor. Nothing could have been further from my intention, since my suggestion was essentially to the opposite effect, *i.e.* that reasoning (intelligence) is the development of instinct. Is it too much to suppose that the progenitors were less active than their descendants? The, if I may so term it, accidental possession of a roving impulse would then have been of benefit to an individual. There would not appear to be any necessity for such an impulse to have been the result of a reasoning that it would lead to the acquisition of food. At the same time, without having been in any way a cause of the impulse, food may nevertheless have been more easily acquired as its result. Such an impulse, being beneficial, would be likely to be transmitted, as would also any advantageous modification in succeeding generations.—*H.*

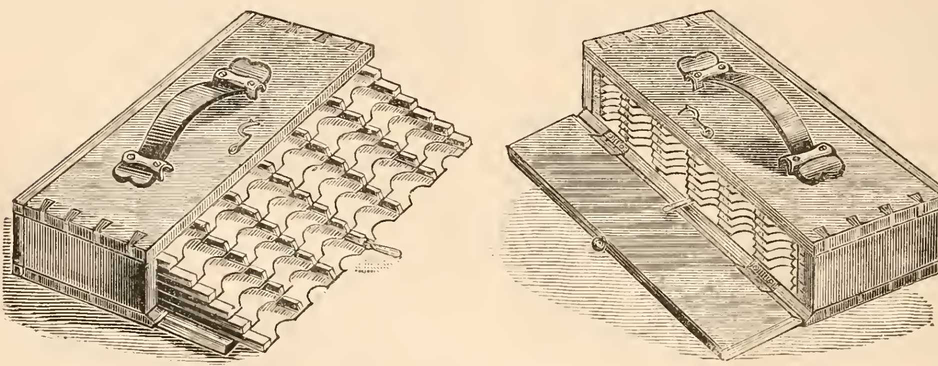


Fig. 40.—Mr. Mosely's New Box for Slides.

The Linnean Society.—At the last meeting of this society, Mr. W. H. Jackson exhibited and gave an account of an electric centipede (*Geophilus electricus*), detailing the circumstances under which he had found it at Oxford, and the result of experiments which he had made with a view of determining the nature and properties of a luminous fluid secreted by it. This he found could be separated from the insect, and could be communicated by it to every portion of its integument. Mr. J. E. Harting pointed out that the observations made by Mr. W. H Jackson on this centipede had been long ago anticipated by Dr. Macartney in an elaborate paper on luminous insects, published in "Philosophical Transactions" for 1810 (vol. c. p. 277).—A paper was read by Mr. T. Johnson on Dictyopteris, in which he gave an elaborate account of the life-history of this brown seaweed, with remarks on the systematic position of the Dictyotaceæ. —Mr. W. P. Sladen detailed the more important portions of a paper by the Rev. J. Gulick "On Intensive Segregation and Divergent Evolution in

Entomological Society of London.—At the annual meeting, the Right Honourable Lord Walsingham, F.R.S., President, delivered an address. After pointing out that many people we meet in everyday life regard the study of insects as waste of time, he illustrated its usefulness by reference to Economic Entomology, notably the destruction of the scale-insect (*Icerya purchasi*), so injurious to orange-groves in California, by means of imported larvæ of its Australian enemies and parasites. He mentioned the facilities afforded in entomology for studying questions of protective resemblance and hereditary transmission, as shown by Weissman, Poulton, and others, and hoped that some light might yet be thrown upon organic chemistry in relation to colour changes. He said that entomology often afforded valuable evidence as to the progress of geographical distribution, the insects which affect the eucalyptus in Australia not having accompanied it on its introduction into Europe. He claimed that entomology was the chief attraction in the greatly increasing number of naturalists' societies and field clubs; and that the study was not only useful, but very popular, providing a civilising and refining recreation for many dwellers in towns. Referring to the vast scope of this field of study, he accepted Dr. Sharp's estimate of 2,000,000 existing species of insects, of which about 200,000 are described. At the present rate of 5,600 annual additions, it would take 340 years to complete the lists. During twenty-four years of the publication of the "Record of Zoological Literature," 42½ per cent. of its pages had been occupied with entomology. In the "Biologia Centrali Americana," dealing with the whole terrestrial fauna of a district of 900,000 square miles, 30,000 species of insects would be recorded, of which 43 per cent. are new, all other branches of zoology, exclusive of spiders and land-shells, producing only 1937 species, less than 5 per cent. being new. Noticing the rich collections in the British Museum, he pointed out that after recent changes only six regular entomologists were now employed to classify and arrange some 20,000 annual additions, to attend to visitors and students, and to describe novelties, always keeping up a knowledge of the vast literature of the subject; whereas the authors of the "Biologia" had to employ twenty-two specialists on entomology alone, seven only for all other branches of zoology. He regretted that the public funds available were insufficient to provide a much larger staff, or to form a separate department.

BOTANY.

Autumn Colours.—Professor J. H. Pellsbury has the following remarks on autumn colours in the last number of "The American Monthly Microscopical Journal":—"In addition to the chlorophyll of plants, there is generally present in their cells a small quantity of certain other colouring matters, as xanthophyll, erythrophyll (yellow and red colouring matter), both of which are derived from chlorophyll by the chemical forces of the plant, but which are in so small proportions as to be more or less completely covered up by the presence of the chlorophyll. If from any cause these are increased in quantity, they give their peculiar colour to the leaves, as is the case with foliage plants. In the normal growth of the plant, especially of perennial plants like our forest trees, the early summer is the period of rapid growth. Later in the season the cells formed in the early summer become hardened into wood, and active growth ceases. At this time the portion of the chlorophyll is changed to xanthophyll and erithrophyll, and a portion withdrawn to other parts of the plant. This leaves the bright colours in sole possession of the cells, and gives the peculiar tints to the autumnal leaves. These changes are affected by the variations of the season. When the season is very dry the nutrition of the plant is interfered with, and the growth ceases at an abnormally early date, and the colours make their appearance earlier than usual, but are less brilliant. Early frosts destroy the life of the leaf, and prevent the brilliancy of the colours. A great degree of moisture seems also to produce early changes. During the past very wet season in New England the leaves of maples in wet grounds showed bright colours early in August. A medium amount of moisture and late frost seem to be favourable to the greatest brilliancy in leaves. The colours of flowers and fruits are due to similar changes in which other colouring matter of a slightly different chemical composition is produced. The chlorophyll of the green flower or fruit is changed into a special colouring matter. This in the case of yellow flowers is anthoxanthin; of white flowers, anthaleucin; of blue flowers, anthocyanin, &c. These changes are produced as the fruit matures, or the flower opens. Violet and purple tints are probably due to the action of acids in the cells upon their colouring matters. The fall of the leaves is due to the peculiar structure of the leaf petiole. A layer of rather large cells at the union of the petiole with the stem of the plant is deprived of some of its nourishment, whereby its walls remain thin, and the protoplasm becomes at length dried or killed by frost, when the cells shrivel and break, and the leaf having nothing to support it falls to the ground.

Monstrosity of Hyacinth.—Early in January, I had a double pink hyacinth grown in water in flower. One of the flowers consisted of two flowers united throughout. The stalk exactly resembled two stalks joined together. The twin ovaries were distinctly visible. On dissection, I found the ovaries small but quite perfect with separate styles. There were thirteen stamens. Is this kind of monstrosity common? Although rather early, the plant had not been in any way forced. Is it likely to occur next year in the same bulb?—*H. J. Perrett, Farnham, Surrey.*

Erodium maritimum.—On June 9th, 1889, I found this plant growing on a bridge that crosses the Trent, at Little Haywood, near Stafford. This bridge was built in 1887-8, so I thought it must have been brought there with the ballast. On November 24th, 1889, I ascertained that the gravel was dug from some pits on Cannock Chase, about half a mile away. I visited these pits, and found a large number of plants of *Erodium maritimum* growing in two places where the sandstone and conglomerate rocks have been laid bare, on the east slope of a low range of hills that terminate just above the gravel pits. A friend of mine has also found two or three species of maritime beetles on Cannock Chase.—*Jno. E. Nowers, Burton-on-Trent.*

FLORAL MONSTROSITIES.—Seeing your article in the February number of SCIENCE-GOSSIP on A Double Sunflower, brought to my mind a similar monstrosity in ox-eye daisy (*Chysanthemum leucanthemum*), which was growing wild in Westhoughton in July, 1888. The scape was to all appearance like those of other flowers, but on the top were two perfect flower-heads.—*John Fletcher.*

THE DISAPPEARANCE OF BRITISH PLANTS.—The British Association appointed a committee "for the purpose of collecting information as to the disappearance of native plants from their local habitats." At the 1889 meeting this committee presented a "second report," which was printed in the "Journal of Botany" for 1889, pp. 359–365. This is far too long to reproduce in SCIENCE-GOSSIP, so I propose to merely make a few observations on the general purpose of this report, and to ask the readers of SCIENCE-GOSSIP to give any assistance they can in the prevention of the undue gathering of our native varieties. The committee are severe on dealers, and rightly so, for though "bread" will hold its own before sentiment, still in my opinion the buyers are worse than the dealers. Look at our ferns. Time was when I could, within three miles of my home, gather twelve species; it would puzzle any one now to find half that number. Day after day in spring do we see these gatherers pass with their baskets loaded. This report is confined to Scotland, and it would have been well had the committee have allowed some competent botanist to have looked it over; it would have avoided such mistakes as "*Primula scotica* Hut. Marsh near Edinburgh, Pentland Hills; practically extirpated.—G. A. P." Of course the plant meant is *P. farinosa*, which, however, is still to be found within a good walk of "Auld Reekie." The actual (or supposed) disappearances are of less interest than the general principle involved. The greed for rare plants is, I regret to say, very great. One instance in my own experience will suffice. Some years ago I mentioned in SCIENCE-GOSSIP that I had seen *Orchis simia* in plenty. What I actually did see, was twenty-three specimens in full flower on one bank. I will not (for very shame) say how many letters I received asking for the "exact station" where I found this very rare species. To those who know me I need hardly say that to no one has that habitat ever been given; and I feel sure that I could easily walk to the spot again, as it was one very unlikely to be disturbed. Why cannot botanists be satisfied with a fair share of what they find? Suppose those who have gone before us had gathered specimens in the wholesale way that some present botanists do, our "finds" would have been much diminished; and we have surely the right to think of others who will come after us. It requires great care before any one can assert that a plant has disappeared, and some years' visiting of the station. The truth is, plants appear, disappear, and reappear in a most remarkable manner, and very difficult to account for without a careful study of the surroundings *in situ*, and a residence near. What is wanted is, that any botanical readers of SCIENCE-GOSSIP who can give any authentic information of the disappearance or extirpation of any plants in their neighbourhood, the probable cause, or suggestions as to the why and wherefore; whether from drainage, cultivation, felling or "grubbing" of woods, extirpation by dealers, collectors, or "botanists," or any information that may lead to a reasonable deduction, will do so to the Secretary, Professor Hillhouse, at the offices of the British Association in London.—*Arthur Bennett.*

NOTES AND QUERIES.

SPARROW'S EGGS.—Mr. Tracy mentioning having found two specimens of sparrow eggs coloured at the smaller end is very interesting, and I hope if other collectors have met with many of them they will record the fact, for it appears curious that in the very many hundreds of the eggs of the sparrow I have examined that I should have only found one specimen. It also appears curious that with the sparrow pigmy and double eggs should be so infrequent. I have met with but one of the former, and not one of the latter.—*J. P. Nunn.*

KESTREL'S EGGS.—The taking of the two clutches of the eggs of the kestrel mentioned by Mr. Lines helps to confirm the statement I made in your journal some time back, that taking a few clutches of eggs in no way diminishes our stock of birds.—*Joseph P. Nunn.*

BIRDS' EGGS.—While there is a good deal that is interesting in Mr. Wright's article on birds' eggs in your January number, one cannot but ask, what does it all amount to merely that all the eggs in a nest are not precisely alike? Considering the infinite variety in nature it would be strange if they were. Moreover, the peculiarity in question is not confined to birds. My tabby cat has just given birth to four kittens, two tabbies like herself, one black, and one black and white. My neighbour's fox-terrier has just had a litter of puppies all marked differently. In fact I know a family of twelve children, all differing from each other, some with fair hair some with dark; some tall and some short; some with noses inclined to turn up, and some with noses inclined to turn down, and yet up to this time I have not heard of any one writing a magazine article calling attention to the variety in my friend's family, and if such differences exist elsewhere, why should we think it strange that a bird does not lay all her eggs of one pattern. I fear that one result of the article in question will be to set many of your readers hunting after birds' nests in order to verify or disprove Mr. Wright's statements. It is hardly worth while, and the mischief would exceed any good to be gained. Judging from your exchange column, the practice of plundering birds' nests is much too prevalent and needs repressing rather than stimulating. It is to be feared that the growing taste for natural history is in too many cases merely a taste for collecting, and our wild plants and birds suffer in consequence so that many species are likely soon to become extinct.—*W. Ward.*

Birds and Buds.—We are much favoured by the birds here, but, as is to be expected, they levy a very heavy toll on fruit buds, and later on fruits. I will not allow any to be shot or trapped. On reading the number for this month, I find a reference in Mr. ——'s letter to a windmill and bell which appears to be used for frightening birds. Can you favour me with any particulars about it, and where it can be got? —*B. B., Kenley, S.O.*

Fatal accident to a Sparrow.—The following account of a fatal accident to a sparrow may be of interest, as it demonstrates the force with which birds propel themselves. My man, while passing to-day (20th December, 1889), through the haggard, was struck on the back of his hand by a sparrow which formed one of a small flock that was as usual feeding on what grain they could find, and was disturbed by the sound of his footsteps. The sparrows came round a stack and could not have been more than a couple of yards from the spot whence they started, and yet the bird by which the man was hit was flying with such velocity that its beak penetrated the flesh for one eighth of an inch, and it was instantly killed by the blow. I have seen as many as five greenfinches dash themselves to death on a dark night by darting against the window of my library, whither they were attracted by the lamp-light inside the blinds, but this incident of the sparrow is more curious.—*H. W. Lett.*

Vandal Naturalists.—Mr. J. P. Nunn, in Science-Gossip for January, 1890, says that he believes the great majority of birds' nests are forsaken when the clutches of eggs are disturbed. If this were the fact it would be a strong argument in favour of egg-collectors taking clutches, but experiments I have made have satisfied me that this is not the case. The one thing nesting birds do object to is being startled while on their nests; if you make a sitting-bird leave her nest in a great fright she will probably never return to it again, but if you walk up to her quietly, and coax her off gently, you may experiment with her eggs without causing her to forsake her nest. I have substituted all sorts of things for the first few eggs of a bird, and found that she has completed her clutch notwithstanding. Referring to my notes of such experiments, I find that I have substituted for the eggs of the reed-warbler small pebbles, mud rolled up into balls, bits of wood, and even saloon pistol cartridges, and still the bird has gone on laying, in some cases throwing out the foreign bodies, in other cases allowing them to remain in the nest. For the eggs of the lesser red-poll I have substituted those of the sedge-warbler, and even leaden bullets, and the bird has not forsaken her nest. Reed-buntings and yellow-hammers I found invariably threw out pebbles or other birds' eggs placed in their nests, but still continue to lay in those same nests. The magpie and the dipper continued to lay after stones had been substituted for eggs, and even a wood-pigeon, which many text-books on ornithology tell one will forsake its eggs if one so much as touches them, laid its second egg after a stone has been substituted for its first. I have experimented with many other birds with similar results; the house-sparrow is the only bird I have found to quickly resent any interference with its eggs. One may generally take two eggs out of a nest containing five and not substitute anything for them, without the slightest fear of causing the bird to forsake. I once took the first two eggs from a rook's nest, leaving the nest empty, and the bird went on laying therein, and eventually hatched out three young ones. The bird must lay her full clutch of eggs, she has a nest ready to receive them, and, as I said before, fear for her own safety is the one thing that causes her to forsake her nest. If birds were as knowing about their eggs as Mr. Nunn would have us believe, the eggs of the cuckoo would stand a very poor chance of being incubated. The facts I have related above show that a collector does not cause a bird to forsake its nest when he takes one or two eggs out of it. Mr. Nunn says that "the physical strain from a bird having to lay a second clutch is nil, or the poor hens which supply us with our daily egg for breakfast would soon all die of inanition." I don't think Mr. Nunn can be a poultry keeper. There is a process known amongst pigeon fanciers as "pumping" a bird, which means getting a hen pigeon to lay several clutches of eggs in quick succession by taking the eggs away from her and hatching them under pigeons of inferior breed. Now it is well-known that a pigeon's constitution is very much impaired by being "pumped." The "poor hens" also must have a large supply of food given to them, more than they could possibly find as wild birds, in order to induce them to supply us with our "daily egg"; moreover, under this treatment, after the first two years of their lives, they are practically useless for laying purposes. Therefore, if clutch collectors rob a bird of its clutch of eggs several times in succession, its constitution will be weakened and it will very soon be rendered a barren bird. I think most people will agree that a bird's "chance" is considerably better when it is allowed to keep three eggs instead of none at all. I have been hoping that Mr. Nunn would bring forward some real arguments in favour of clutch collecting; at present he contents himself with calling non-clutch collectors "pilferers" and "mawkish sentimentalists." Well, if the birds were to be asked their opinion, I think they would say, "We are not very fond of the 'pilferers,' but we positively hate the wholesale robbers!"—*E. W. H. Blogg, Cheadle, Staffs.*

Animalcula.—Your correspondent, "Medica," having gracefully acknowledged her fault, I wish to acknowledge mine; but with this explanation: The feminine form of the signature did not escape my notice, but somehow the idea had fixed itself firmly in my mind that the writer was a man, and without giving the matter a moment's further consideration I jumped to the conclusion that "Medica" was a misprint, but decided to copy it literally. The existence of lady-doctors did not occur to me—perhaps from never having seen one.—*W. P. H.*

Birds' Eggs, November number (p. 258).—In answer to the inquiry of Mr. W. W. Reeves, it is well known that the markings on birds' eggs are easily removed with soap and water. The lines and spots on the eggs of the chaffinch, the buntings, the wind-hover and other hawks, soon disappear when the shells are rubbed with a damp cloth. Egg-collectors should therefore handle such eggs as little and as carefully as possible.—*W. H. Warner, Fyfield, Abingdon.*

Sea Monsters.—On the 18th of November last, according to an account that appeared in "The Echo" newspaper, a gigantic squid, the representative of our old friend the great sea serpent, was to be seen, washed on shore, at Dugort, in Achill Islands, on the west coast of Mayo. It was stranded for some months on one of the outlying reefs at the entrance to Blacksod Bay, where the villagers took it to be the carcase of a large whale. It was afterwards carried on to the beach by the gale which swept over the Western Ocean on the night of October the 4th. The suckers, horny rings, and parrot-like horny beak, had fallen off, and it was too far gone in decay to be specifically recognised: the length of the tentacles or long arms was 30 feet each; the circumference of body, including short arms, 60 feet, and the circumference of the tentacles in some places four feet. It would appear to be the fourth recorded instance of the appearance of this strange monster in British waters; and from a list of such marvels cast upon our shores variously compiled, I conclude that a great percentage is owing to the storms at the maximum and minimum of sun-spots. How disastrous might have been such an event to Hibernian politics in the days of Daniel the Prophet. "The only events attributed by Berosus to this portentous antediluvian period," says Sir George Cornewall Lewis in his "Astronomy of the Ancients," "are the periodical appeances of certain amphibious monsters, compounded of man and fish, like the mermen of medieval fiction, who passed the night in the Red Sea, but came upon land during the daytime. The prevailing name for these monsters was Annedotus; but some of them received other denominations." The kings then lived the following number of Sari: Alorus, 10; Alaparus, 3; Amelon, 13; Ammenon, 12; Amegalarus, 18; Daonus, 10; Enedorachus, 18; Amempsinus, 10; Otiartes, 8; Xisuthrus, 18; in all, 120 Sari. Fanatical kings after the deluge would have proportionately shorter lives; and taken as years this may not inaptly represent our modern sun-spot epochs, so it is probable that we have here, from some source or other, an Assyrian Book of Fate.—*A. H. Swinton.*

Bees.—I hatched a bee yesterday (Sept. 30th) under peculiar circumstances. A door lock was found to be in non-working order, and when it had been taken to pieces the inside was discovered crowded with cells, the production, I believe, of a mason bee. It presented a remarkable appearance; the cells, constructed of clay, having a roughly hexagonal arrangement, and being covered at the top with a liberal food supply in the form of yellow masses of pollen. Each cell had a pupal sac inside, dark brown in colour, but coated with grey down. The key-hole was wonderfully small, so that I presume the colony was formed by a single female. I opened a case containing a living bee; the head and thorax appeared to be black, the abdomen dark brown with golden yellow hairs. The wings were imperfect as yet, but transparent. In another locality I have noticed a similar kind of bee, each having a solitary hole in a bank, and basking in the sunshine at the entrance until frightened in at the approach of footsteps. They spent most of the day in collecting pollen from a coniferous tree hard by, returning from each journey laden in the accustomed manner. The two were either identical or closely allied species. I presume it is right to style them mason bees. In the summer a leaf-cutting bee was at work in the garden. It cut absolutely true circles in the scarlet geranium petals. I tracked the flight by the colour, finding the nest in a hole in the wall; the fragments of petals formed a lining to the cell in the mortar between the interstices of brick.—"*Bee Hunter.*"

Gutta-Percha.—The history of the discovery and development of gutta-percha is one of great interest. It was first brought to notice in 1842, at Singapore, when it attracted much attention, and soon found its way to Europe; one of the first uses to which it was put being for soling boots, in consequence of its imperviousness to water, and its supposed greater durability than leather. Being easily moulded by heat, it was soon applied to the manufacture of pails, buckets, basins, water-pipes, door-handles, knobs for drawers, and a host of similar purposes. In consequence of its being a non-conductor of electricity, coupled with its durability under water, it soon became used for coating the wires of deep-sea telegraphs, for this purpose, however, indiarubber is now much more extensively used. The plant was originally described by Sir W. J. Hooker, in 1847, in the "Journal of Botany," under the name of *Isonandra gutta*, which has since been sunk under that of *Dichopsis gutta*, Benth. by which name the true gutta-percha-yielding tree is now known. It is a large tree, sixty to seventy feet high, with a trunk two or three feet in diameter. At the time of its discovery it was abundant at Singapore, but during the next five or six years it was so persistently destroyed for the extraction of the milky juice that the tree was almost exterminated, and at the present time only a few trees, that are carefully preserved as curiosities, exist at Singapore. In 1847 it was plentiful at Penang, but a similar fate has overtaken it there. To collect the milk, the trees are cut down, and the bark is stripped off, when it flows readily, and is collected in a cocoa-nut shell, the spathe of a palm, or some similarly improvised vessel, and formed into blocks or lumps of various sizes and shapes, the fluid quickly coagulating on exposure to the air. The average quantity obtained from one tree is about twenty pounds, and as the imports into this country amount to between 40,000 and 60,000 cwt. annually, an enormous number of trees have to be sacrificed to supply the demand.—*From Cassell's "New Popular Educator."*

Copper-Plates from Nature.—Plants, insects, etc., are copied in the following manner by Auer in the Government Office at Vienna: The plant is placed between sheets of blotting-paper, pressed, and allowed to dry: it is then placed in water, and again left to dry. The plant is then laid upon a smooth lead plate, covered with a steel plate, and exposed to pressure, and a mould is obtained from the impression left on the lead; the copper-plate prepared from this mould is used in the press. For etching plates Smee gives the following directions: The copper plate is covered with a substance such as wax, pitch, resin, etc. The drawing is then made with a needle so that the bright copper is visible. The plate is then placed in a copper bath forming the positive electrode. The oxygen given off at the positive electrode oxidises the copper at the bright portions, and this oxide dissolves in the sulphuric acid. At the negative electrode, which is also a copper-plate, copper which is separated out is deposited. When etchings are required which are not uniform, the copper-plate must be taken out of the bath, and the portions that are not to be etched further must be covered with wax.—*From "Electricity in the Service of Man."*

Mosses.—Attractive and luxuriant as are so many of our common mosses in a state of nature, and, as a casual observer may be led to believe, therefore of easy culture, they are nevertheless by no means easy to grow with any degree of success under the widely different conditions which generally obtain artificially. A few hints as to the species most likely to please, and the best way in which experience has taught the writer to treat them, will be given. If no special structure is forthcoming, many mosses may be readily grown in a cold frame, or among other plants in a cool, shady fern-house. Several (many of the hypnums, for instance) grow thoroughly well on a piece of rock or brickwork, moved from the natural locality in a piece. In building an indoor fernery it is as well to use a few moss-covered stones here and there. In a short time the other pieces of rock will become clothed with a covering of moss plants, amongst which the rhizomes of creeping rooted ferns will luxuriate. Any moss, which, in the woods or other spots where mosses abound, may strike the finder's fancy should be lifted with a good portion of the soil, and planted in a thoroughly drained medium-sized pot. The base of the tuft should, in case it has not been removed with soil sufficient, be placed in immediate contact with such material as most nearly resembles that on which it naturally grows. This is somewhat important, as although some grow in almost any soil, others affect more or less a particular one. The smaller-growing rock species simply require to be taken with the stone on which they grow; the larger ones should be fastened on similar stones, with wire or some other contrivance, until they have attached themselves. The moisture-loving ones, such as some of the Bartramias, the water-loving Hypnums, and Dicranums, should have the pots kept in saucers filled constantly with water, by which means their roots are regularly supplied with water. All are better with pretty frequent syringings of rain-water. Most of the kinds are in a state of rest, more or less definite, during the summer months; these can then be placed on ashes behind a north wall, and left to themselves without further care than an occasional watering. In order, however, to prevent birds from rooting up the tufts in search of insects and worms, and thus interfering materially with the welfare and appearance of the plants, it is well to have netting fixed over them in such a way as to prevent the incursion of such unwelcome visitors. *Hypnum tamariscinum* and its allies make beautiful objects if kept in a moist, shaded spot, and not a few hypnums thrive on turves of fibrous peat. The hookerias, too, grow freely either on moist stones or in prepared pots of small pieces of almost any porous stone. In a well-shaded case in which ferns succeed, pieces of wood or moss-covered branches may be placed, and the wonderful variations in colour, in length, direction, and form of their stems and branches—not to speak of the differences in the capsules—cannot fail to appeal to the admiration of all who love plant life. *Hypnum splendens*, well established, makes a specimen which for grace and delicacy can hardly be surpassed. *Climacium dendroides*, with its erect stems and feathery dark green foliage, is quite as charming as any miniature fern. It requires a well-drained fibrous peat, and abundance of moisture.—*From "Cassell's Popular Gardening."*

Fox and Lapwing.—That the lapwing, or "peewit" as it is more generally called, is a bird of very quarrelsome proclivities is well known to all country dwellers. When out for a ramble one afternoon in May, 1887, I saw a fair of lapwings attacking in their usual boisterous fashion some arrival making its way across a piece of waste land. This proved to be a large fox skulking along among the heather and ragwort, and cowering in the most abject fashion as the birds swooped round him. Quickening his pace, he jumped a wall and cantered through a furze-brake on the heath, scattering the bunnies in all directions. The birds seemed to actually strike him with their wings.—*W. H. Warner, Fyfield, Abingdon.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

W. M.—The address of Reichert, the objective maker, is—Ch. Reichert, viii. Bennogasse 26, Vienna, Austria.—*W. Child.*

C. Ledger.—Many thanks, also, for Reichert's address. It is given above.

W. L.—The best thing you can do is to advertise in one of the most widely circulated scientific journals.

R. Coupar.—The address of "Nature" is Macmillan & Co., 29 Bedford Street, Covent Garden.

J. Halsey.—We are much obliged to you for forwarding the sketch of the zoophyte, but it is impossible, without the specimen, either to identify you or to set you on the right road to do so.

W. Webster.—The publishers of the "Microscope," 145 N. Greene Street, Trenton, New Jersey, U.S.A., agent for England, W. P. Collins, 157 Great Portland Street, London; "Journal of Microscopy," Baillière, Tyndall & Cox, 20 King William Street, Strand.

Ed. Mosley.—Double hazel nuts are not at all uncommon; indeed, they have led to a bit of innocent fun at parties, the possessor of one being deemed lucky. If you get a specimen of any hazel nut or acorn in its earliest stage, you will find a two-celled ovary with a seed or kernel in each. The rule is for one of them to become developed and the other aborted, but occasionally they are both equally developed, as in your specimen.

EXCHANGES.

Int. Science, London. Very complete set of chemical reagents and apparatus. Breechloader wanted, or offers.—E. J. Batty, 37 Blomfield Road, W.

Linum perenne.—Will the gentleman in the Isle of Wight who wrote to me early in January respecting this, kindly send his name and address, as his card was unfortunately mislaid?—H. J. Perrett, Farnham, Surrey.

Sach's "Text Book of Botany," in good condition, half morocco. What offers?—E. C. Robinson, 46 Fishergate, Preston.

Wanted, a set of dissecting instruments, also the following books in good condition: Davis's "Biology," Lloyd Morgan's "Animal Biology," and Marshall and Hurst's "Practical Zoology," for which good exchange will be given.—H. W. Parrit, 103 Camden Street, London, N.W.

Wanted, Hogg's "Microscope," and other microscopical works, in exchange for choice micro-slides and British marine shells.—R. Suter, 5 Highweek Road, Tottenham, London.

Wanted, small living seaweeds in exchange for good microscopic slides.—A. Draper, 179 Cemetery Road, Sheffield.

Copper pyrites and a number of stamps (used and unused), also the following eggs: robin, ring-dove, yellow bunting, meadow pipit, hedge accentor, song thrush, blackbird, skylark, in exchange for iron pyrites, fluor spar, asbestos and calc-spar, named and localized, or a small selection of greensand fossils, named, &c.—H. Durrant, 4 Boulton Road, West Bromwich.

Science-Gossip, twelve years, 1878–89, unbound, complete; vol. i. bound. Offers to—Alfred Dymes, 1 Colville Houses, Notting Hill.

Genuine "Challenger," and other choice foraminifera, neatly mounted, in exchange for foraminifera from the London clay, red chalk, or good deep sea soundings.—J. Ford, Wickham Lodge, Kew.

Ants of every species, British and foreign, with all particulars where obtained, wanted for exchange.—Mark L. Sykes, F.R.M.S., Winton, near Manchester.

Wanted, No. 1 (March, 1887), "Wesley Naturalist," in exchange for two good mounted, or twelve named, selected, unmounted micro objects.—Charles Watkins, Painswick, Gloucestershire.

EXOTIC butterflies. Duplicates of many rare species, including *Papilio Elwesi* (vide "Trans. Ent. Socy. Lond., 1889," pt. 1. pl. 7), brookiana, buddha, solon, paphus, &c. Wings for microscope.—Hudson, Railway Terrace, Cross lane, Manchester.

BEAUTIFUL specimens of carboniferous fossil plants, correctly named, in exchange for micro-slides of rocks and fossil plants, or Cambrian, Silurian, and Devonian fossils. Lists exchanged.—W. Hemingway, Old Mill Lane, Barnsley, Yorks.

WANTED, *Bythinia Leachii*, *Pupa ringens*, *Bulimus montanus*, for other land and freshwater shells.—John Radcliffe, 111 Oxford Street, Ashton-under-Lyne, Lancs.

WANTED, *Triton rubecula*, *Terebra maculata*, *Cerithium recurvum*, *Strombus variabilis* (*luhuanus*), *pugilis*. Good exchange given in other exotic species.—W. J. Jones, jun., 27 Mayton Street, Holloway, London.

L. C., 8th ed. I shall be glad to exchange the following for good specimens of other rare plants (British): 4, 185, 198, 288, 291, 345, 372, 373, 395, 401, 403, 552, 611, 647, 688, 721, 805, 944, 1086, 1089, 1154, 1255, 1339, 1344, 1354, 1361, 1408, 1424, 1551, and others.—G. Goode, 3 Tenison Road, Cambridge.

THE new Japanese diatomaceous dept. of Sandai. Raw or cleaned material sent in exchange for other good diatomaceous earth, marine preferred. Send list and approximate quantities to—M. J. Tempère, 168 Rue St. Antoine, Paris.

Pecten maximus, *Cardium echinatum*, *Cyprina islandica*, *Venus exoleta* and *ovata*, *Scrobularia tenuis*, *Tectura testudinalis*. *Haliotis tuberculata*, *Trochus tumidus*, *T. ziziphinus*, v. *Lyonsii*, and *T. Montacuti*, *Trichotropsis borealis*, *Lachesis minima*, *Trophon truncatus*, *Fusus antiquus* and *gracilis*, *Pleurostoma turricula*, *Otina otis*, and others more common. Wanted, shells, insects, mounted micro objects, or books.—W. D. Rae, 23 Pekin Street, London, E.

WANTED, books on marine algæ. Offered, good one-sixth objective, 110°, shows beaded striæ on *Surirella gemma*; Gosse's "Year at the Shore," 35 coloured plates; Brown's "Manual of Botany," "Testimony of the Rocks," "Dowden's "Shakspere," Smiles' "Self Help," and "Life of Stephenson," whole calf, other books, rare algæ, and slides.—T. H. Baffham, Comely Bank Road, Walthamstow.

WANTED, Carpenter's "Micro Manual," latest edition, in exchange for air-pump, one-eighth objective, or air-gun.—H. E. E., 344 Caledonian Road, London.

DUPLICATES.—British land and freshwater shells in great variety, also birds' eggs and the following lepidoptera: rubiginata, didymata, and vespertaria, also bird skins. Desiderata, foreign lepidoptera.—W. Hewett, 6 Howard Street, Fulford Road, York.

WANTED, good foreign postage stamps. Will give books, shells, or micro-slides in exchange.—A. Alletsee, 1 South Villas, Kensington Road, Redland, Bristol.

WANTED, vol. v. of Jeffrey's "British Conchology," also SCIENCE-GOSSIP (unbound) for 1884.—J. E. Cooper, 93 Southwood Lane, Highgate, N.

MARINE algæ and zoophytes, specimens for herbarium and micro-mounts, in exchange for other micro-mounts or books on botany and microscopy.—J. T. Neeve, 68 High Street, Deal.

MOUNTED slides of anthers, and pollen of mallow, foraminifera, stained botanical sections, and other slides; "Introduction to the Study of Insects," by Priscilla Wakefield, with hand-coloured plates (1816), and medical shocking coil of three powers. Offers to—P. Kilgour, 21 Grieve's Terrace, Lochee Road, Dundee, N.B.

OFFERS wanted for an Orme's South Kensington set of chemical apparatus (qualitative analysis), also some useful physical apparatus, either set suitable for students or amateurs, also several volumes and odd numbers of various monthly reviews and magazines. Detailed particulars of—C. G. Engert, 30 Langdon Road, London, N.

SCIENCE-GOSSIP wanted, bound or unbound, for 1870, 1872–75, 1877, 1878.—L. Greening, 112 Bewsey Road, Warrington.

WOULD like offers for Gerard's "Herbal," date 1597, title-page, portrait, and coat of arms in good condition, pages 32–40 missing, the rest of the book complete, and recently rebound in half-calf.—T. Pluce, 2 Townsend Street, York.

OFFERED, Miall's "Geology, Natural History, and Antiquities of Craven," with geological map, also "Journal of Botany," 1883. Wanted, "The Naturalist," 1889, and Grattan's "Marine Algæ."—C. H. Waddell, Whitewell, Belfast.

WANTED, fossils from red crag and chalk, also old china. Offered, cleaned scales of royal sturgeon, fossils from Wenlock limestone, and coal measures.—A. T. Evans, Cottesville, St. Oswald's Road, Small Heath, Birmingham.

SCIENCE-GOSSIP for 1883–89, including the coloured plates, unbound, offered for a King's "American Dispensatory." State which edition.—Charles Ledger, 30 Greenwood Street, Oldham.

FOR disposal, a collection of foreign stamps. Offers requested.—Thomas E. Sclater, jun., Bank Street, Teignmouth.

WANTED in exchange, the following books: Grattann's "British Marine Algæ," Jeffrey's "British Mollusca," "Shell Collector's Handbook," Johnston's "Introduction to Geology," Hooker's "British Flora," also books on "British Graminæ," "Foreign Shells," "Mineralogy," "Geology," "Our Common British Fossils," "Recent and Fossil Shells." Also wanted, glass-top boxes, and nummulites from the Riviera. Please state desiderata required in return, to—Alfred J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, S. Devon.

WANTED, odd numbers of the "Annals of Botany," Goebel's "Outlines of Morphology and Classification," and De Bary's "Fungi and Mycetozoa;" also good botanical slides.—C. A. Whatmore, Much Marcle, Gloucester.

WANTED, fossils from rhætic beds, Cambrian, Devonian, old red or new red sandstone, or bones and teeth of mammals from Norwich crag. I will give a liberal exchange in carboniferous fossils, some rare and good, for a few good specimens from any of the above.—P. J. Roberts, 4 Shepherd Street, Bacup.

WANTED, dried leaves, grasses and mosses, in exchange for foreign stamps, &c.—J. W. Alstead, Back North Street, Jarrow.

WHAT offers, SCIENCE-GOSSIP for 1887 and 1888, "Entomologist" for 1889, and "Our Earth and its Story," 3 vols. All unbound, but clean, and in excellent preservation. Desiderata, autographs.—R. H. Lawton, 6 Mosley Street, Manchester.

DUPLICATES.—Clutch of six red-backed shrike, two red-legged partridge, and eggs of guillemot. All side blown, data given and expected. Wanted side-blown eggs of British birds. Offers to—F. W. Paple, 62 Waterloo Street, Bolton.

WELL mounted slides of palates of molluscs in exchange for British shells.—A Vigar, 77 High Street, Ramsgate.

WANTED, at once, Bower's "Practical Botany," in good condition, either the edition in two vols., or that in one.—A. G. Tansley, 167 Adelaide Road, London. N.W.

SECTION of spines of Echini, *Acrocladia mamillata* and *trigonaria*, to exchange for other micro slides or British marine shells not in collection.—T. M. Harvard, Lingards Road, Lewisham, S.E.

WANTED, "Carpenter on Microscope," Quekett, ditto, (latest editions). Also good Jackson or Wale's stand, with or without objectives, and perfect or imperfect, in exchange for scientific books and objects.—C. P. Taylor, 26 Marchmont Street, London, W.C.

SCIENCE GOSSIP for 1880, 1883, and 1885, with coloured plates. Foster and Balfour's "Embyrology," second edition, new, Huxley and Martin's "Practical Biology," "Foods," by Dr. Edward Smith, Tome's "Structural and Physiological Botany," Dr. E. Klein's "Elements of Histology," "Professor Young on the Sun," Kolliker's "Human Histology." Wanted offers for any of the above.—T. W. Lockwood, Lobley Street, Heckmondwike, Yorkshire.

BOOKS, ETC., RECEIVED.

"The Scenery of the Heavens," by J. E. Gore (London: Roper & Drowley).—"North American Birds," by H. Nehrling (London: Wm. Wesley & Son).—"Electric Light Installations," by Sir D. Salomons, Bart. (London: Whittaker & Co.).—"Science and Scientists," by Rev. John Gerard, S.J. (London: Catholic Truth Society).—"A Theory of Lunar Surfacing by Glaciation," by S. E. Peal (London: W. Thacker & Co.).—"Is the Copernican System of Astronomy True?" by W. S. Cassidy (Standard Publishing Co., Kittanning, Pa.).—"A Tumour in the Freshwater Mussel," by J. W. Williams.—"American Spiders and their Spinning Work," by H. C. McCook, vol. i. (pub. by author: Academy of Natural Sciences of Philadelphia).—"Elements of Astronomy," by Dr. C. A. Young (Boston, U.S.A., and London: Ginn & Co.).—"The Photographer's Diary and Desk Book for 1890" (London: "Camera" Office).—"Types and Metamorphosis in the Development of the Crustacea," by I. C. Thompson."—"The Textile Mercury.'—"The School Board Chronicle."—"The Entomologist's Monthly Magazine." — "Nature Notes." — "Index to the Microscopical Bulletin."—"Optical Magic Lantern Journal." — "Bulletin of Miscellaneous Information — Royal Gardens, Kew." — "The Naturalist."—"The Entomologist."—"The Camera."—"The Vaccination Inquirer."—"The Geological Magazine."—"Cassell's Technical Educator."—"Revue Scientifique."—"Research."—"The Amateur Photographer." — "The Gentleman's Magazine." — "American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 10TH ULT. FROM: J. E.—E. W. H. B.—P. F. T.—S. P.—J. E. N.—W. W.—A. M.—W. B.—J. S. D.—A. B.—E. C. R.—H. J. P.—J. P. N.—E. J. B.—R. C.—H. W. P.—W. L.—H. W. L.—J. W. Q.—R. H. L.—R. B. P.—F. W. P.—F. W. L.—A. G. T.—A. B.—D. W. B.—G. S. S.—W. H.—J. R.—W. E. C.—G. G.—W. J. J. W. D. R.—J. T.—G. E. S.—E. M.—S. L. B.—J. F.—A. D.—R. S.—T. A. D.—W. D. R.—J. C.—M. L. S.—H. D.—J. F.—H. W. P.—C. I. W.—T. W.—J. W. B.—H.—T. H. B.—T. P.—J. W. W.—C. H. W.—W. W.—G. O. B.—J. B.—T. E. S.—A. J. R. S.—J. E. C.—W. H.—F. T. N.—A. A.—P. K.—A. M.—W. H. W.—E. M.—E. B.—L. G.—G. W. K.—A. T. E.—J. R. B. M.—P. J. R.—C. A. W.—H. E. E.—J. W. A.—F. J. P.

SUBTERRANEAN MOUNTAIN RANGES IN SOUTH-EASTERN ENGLAND.

By THE EDITOR.

SUDDENLY, in the middle of February, there was sprung on the scientific and commercial world, in the shape of a newspaper paragraph, the announcement of a geological discovery which may revolutionise the trade of the south-eastern counties of England. It was announced by Mr. Francis Brady, C.E., the engineer-in-chief of the South-Eastern Railway, to Sir Edward Watkin, chairman of the company, that coal had been reached beneath the chalk at Shakespeare Cliff, near Dover, at a depth of 1180 feet. This seam was struck beneath the chalk after passing through twenty additional feet of clays, grits, and blackish shales which undoubtedly represent the Coal measures. So far as the boring has gone, the resemblance of these beds to those of the Somersetshire coal field is remarkably close.

This unobtrusive announcement was the crowning point of one of the most wonderful bits of geological logic which has been brought before the public. More than a quarter of a century ago the veteran living geologist, Professor Prestwich, as well as Mr. Godwin-Austen, set forth their reasons before the scientific world for believing that at no great depth beneath London and the south-eastern counties there lay the continuation subterraneously of the chain of hills represented by the Mendips in the West of England, and the Ardennes of Belgium. This theoretically buried chain of hills long went by the name among geologists of the "Underground ridge," and it was felt that the rocks composing it must all be those belonging to the Primary period, in the upper part of which occurs the Carboniferous or coal-bearing formation. Not many years after this announcement, which was made before the Geological Society of London, it obtained verification in a very remarkable manner. A deep well had to be bored in Kentish Town, which penetrated the Tertiary and chalk strata, and at a depth of 1300 feet actually bored into the tops of these buried mountains. The specimens brought up by the boring tool proved that they were rocks of the Devonian period, which represent the formation lying immediately beneath the coal. Since then other deep well borings, carried out for the sake of getting at the rich supply of pure water which is usually found in the Green sand beneath the chalk, have borne out the conclusion that there is actually underlying the Metropolis, and the country to the south-east of it, as well as to the north-east, an underground extension of Primary rocks; and the remarkable thing about them is that they run in a continuous but sinuous line tending to connect the Somersetshire coal-fields with those of Northern France and of the Ardennes. Thus at Burford, in Oxfordshire, a boring carried on through the Oolitic formation actually struck the Coal measures at the depth of 1184 feet; at Ware, in Hertfordshire, farther to the east, at the depth of 800 feet, and at Turnford the Silurian rocks were reached at 980 feet; at Loughton, the overlying Devonian rocks resting at a high angle, at 1092 feet. At Kentish Town the upper division of the same formation, rich in fossils, was reached at 1113 feet. Messrs. Meux, the brewers, carried out a deep well-boring, which touched the same underground ridge at 1148 feet. At Crossness the same strata were bored into at 1192 feet.

This demonstrates, by actual experiment, the existence of an underground ridge of Primary rocks beneath the Tertiary and Cretaceous, or chalk strata of the southern and south-eastern counties. These rocks are believed by geologists to occur in what are termed by them anticlinal, or saddle-shaped arrangement of strata. Like all other continuous ranges of mountains, the tops of these subterranean hills would be the first to be denuded and worn down, so that the inferior strata would be touched by borings that happened to strike their crests. It will be seen, however, for the same reasons that farther away from the strike or trend of this underground ridge the rocks lying on the flank to the north and south would be those of later geological date. This means, in other words, that the farther south and north we should go from the trend and the ridge, the more likely we should be in borings to touch rocks of Carboniferous age, or those which contain coal.

Many years ago, in a well-boring, close to Harwich, the flanks of the buried Primary rocks were reached at a depth of 1100 feet. The rock fragments brought to the surface contained fossils which demonstrated to the geologist that they were those of the Lower Carboniferous period. This lower division in England, at least, does not contain coal, but an East Anglian geologist is led to infer, by parity of reasoning, that a little further to the north of Harwich, say somewhere in Mid-Suffolk, a deep boring might possibly reach the upper rocks reposing upon the flanks of this lower Carboniferous series, which do actually contain coal. The discovery of coal beneath the chalk at Dover is all the more easy to be understood when we remember that on the other side of the Straits the coal-fields of Northern France are reached by borings through the chalk at 1100 and 1032 feet respectively, and that considerable quantities of coal are being obtained therefrom. It will be seen that the situation in which coal has been found beneath the chalk, measuring in miles from the crest of the underlying ridge in Hertfordshire and Middlesex south-easterly, would be about the same distance measured north-easterly, to some point in Mid-Suffolk. One of the most remarkable things about these borings is the comparatively low depth at which the Primary rocks have been reached. If coal could be found in Suffolk, say, at a depth of 1200 feet, that would scarcely represent half the depth through which great shafts are carried in rocks much harder and more difficult to penetrate in the coal-fields of the north.

The following statement has been made by Professor Boyd Dawkins: "As the enterprise resulting in the above discovery was begun and is now being carried on under my advice, I write, after an examination of the specimens from the boring, to confirm the report of Mr. Brady. Coal measures with good blazing coal have been struck at a depth well within the practical mining limit, and the question is definitely answered which has vexed geologists for more than thirty years. Further explorations, however, will be necessary before the thickness of the coal and the number of the seams can be ascertained."

The following is a detailed list of the strata passed through in the boring for coal at Shakespeare's Cliff: grey chalk, marl and gault, &c., to a depth of 560 feet, then Kimmeridge clay, &c., for a further depth of 600 feet, and lastly, coal measures, sandstones, shales, and clays for 20 feet. The seam of good coal is 1160 feet below the surface, or 68 feet lower than the point where the coal measures were met with on the boring at Calais. The coalfields of Northern France and Belgium extend across the Channel, and they are at workable depth in the southern counties. The Dover seam of coal is three feet in thickness, and is said to be equal in quality to the Derbyshire coal.

NATURAL HISTORY NOTES FROM NEW ZEALAND.

R. N. HAWES writes (Kohimarama, Auckland, N.Z., 8th September, 1889, received 15th October):—

Here we are, and shall be for a long time to come, in a transition state as regards the question of preservation of native birds or plants. Quadrupeds we have none, or next to none, though I occasionally catch a black or native rat—one of those rats which twenty years back were stated to be extinct.

I do not know that many of the native birds can be preserved, for I am sorry to say they seem to disappear as the introduced birds increase, and as the native plants and grasses get crowded out by the invading host of those from all parts of the world, good, bad, and indifferent, some brought here purposely and others smuggled in, as it were, with them, or in the straw and hay, &c., used for packing purposes.

With insects it has been the same, the large cricket having been brought from India, it is said, in the bedding of the troops sent from that country to this in the war time, while the horrid mason wasp is supposed to have come from Tasmania, in the holes bored by other insects into the stringy bark rails sent here so largely for fencing purposes a few years back. If barbed wire had been invented by the ingenious Yankee, and come into such general use here years back as it has done now, we should not have imported the rails, and our spiders (of certain species that live and hunt among the grass and native shrubs) would not have been in danger of extermination, with the at present unknown or unforeseen accompanying results which are sure to follow.

There is a boundless field now for some enterprising and painstaking Darwin or Lubbock to enter, only to find, perhaps, after years of patient research, that some other bird or insect had appeared, and exterminated the subject of his research, thus giving him the opportunity of beginning anew as a consolation.

Spring is well advanced now, and everything, weeds included, is growing at a great rate.

I took a small swarm of bees on August 16th, which is unusually early, and united them with a queenless hive, to the great advantage of the latter. I found a thrush sitting on three eggs on the 29th, and hope she will hatch them.

I see twenty or thirty blackbirds for one thrush, I think, but can always find more thrushes' nests, the nest of the latter being often built in more open places, while the bird itself is shyer and not so conspicuous in colour.

My starlings are sitting in the boxes I put up in the trees for them, and I hope will have better accommodation next year in the box I have in my mind's eye.

Just now, however, I am, and for some time to come shall be, too busy to build for the birds, for I am putting up or repairing our boundary fence, and replacing the old rails and thickets of furze, briars, and locust or thorny acacia, with wire, plain alongside the paddock, but terribly barbed by the garden and orchard, so as to be boy-proof when the fruit grows. The fence had been put up between thirty and forty years ago—badly done then, I should say—and neglected ever since, but most of the posts (puriri) and many of the rails (manuka and rimu) are quite sound, so I let the former stand, as they looked good for another forty years, merely putting them into line.

R. N. H. wrote on June 16th, 1889:—A pretty little bird, called the white-eye or blight-bird, takes my figs as fast as they ripen. These birds are said to have been blown here literally in a heavy gale some twenty-three or twenty-four years back from parts unknown. I remember seeing them first about in 1866, and asking a Maori about them, but though he said they were "nga manu ote pakeha," or the birds of the foreigner or stranger, they certainly were not introduced by the Europeans.

They do a great deal of good, though, as they go in flights, and clear off at a great rate any small insects they find in the trees and shrubs. I saw a dozen or more the other day on a creeper on the front verandah, and I think they searched every leaf before they flitted on to the next one, a climbing rose.

Bees do wonderfully well here, and mine increased so much that I tried to give swarms away to neighbours, but the neighbours would not take them. I have seen big swarms hanging on the rocks by the sea-shore for a week and nobody would take them, and on fences or trees by the roadside till driven away with stones by the boys.

CURIOSITIES IN BIRDS' EGGS.

THE good example set by Mr. Wright in your January number will, I hope, be followed by other collectors. I therefore beg to offer a few remarks on the curiosities I have personally met with.

There can be no doubt that very many curiosities find their way into collections, representing the eggs of birds to which they do not belong, and the following little episode will show how mistakes are made. An egg was brought to me as the egg of the cuckoo which my friend said he had just taken from the nest of a lark; but when I laid before him two clutches of larks' eggs, each containing an egg the facsimile of the one he brought, he said, "Well! if I had not seen these clutches I should have placed this egg in my collection as that of the cuckoo." The eggs in question are of a pale slate colour, very minutely flecked all over, and having a very fine brown hair-line on the large end; they were taken in the season of 1888. I have some pygmean eggs of this bird, which might be passed for those of the Dartford warbler.

The corn bunting (*E. miliaria*) now and then shows some curious sports. On the 24th of June, 1886, I took a clutch of four eggs, which are of a very pale blue—almost white—with a few under-shell markings. June, 1887, gave me a clutch of four, three of which are large eggs and one very pigmy, which is a rich dark brown. June, 1888.—I obtained a curious set, which are of a sandy—sandy cat—colour, one egg being pigmy, about the size of a small robin's egg; it is so like the egg of a robin, that if I had not known the nest to be found in the middle of a very large field, I should have thought a robin might have followed the example of the cuckoo. I have two eggs which very much resemble those of the hawfinch; there were four in the clutch, but the other two unfortunately fell into the hands of a pilfering collector. June, 1887.—I found a clutch of yellow bunting eggs (*E. citrenella*), which quite form a connecting link with the eggs of the corn bunting; they are of a very pale purplish ground, with rich purple lines and markings. May, 1887.—Stonechat. Six clutch of large eggs, average $\cdot 85 \times \cdot 58$; they are of a pale green, with a zone of colour around the large end. May, 1888.—Nightingale. Five clutch of large eggs of a green ground, flecked with rusty brown; they very much resemble the eggs of the blackbird in miniature. June, 1889.—Spotted fly-catcher. One egg only; there were but two—one hatched very shortly after my attention was called to them. This egg is of a beautiful blue, and under a lens shows a zone of white marks around the large end. 1887.—Four clutch of the tree-pipit; these have a most peculiar frosted appearance. In colour they are of a very pale purplish brown, dotted all over with minute dots of reddish brown. I have seen no others like them. The eggs of the tree sparrow are too erratic in shape, size, and colour, to be curious; but it is curious that I have met with but one genuine pygmean egg of the house sparrow.

Double and abnormal eggs in our domestic poultry are too frequently met with to be worthy of notice, but double eggs of wild birds are exceedingly rare. I have seen but two specimens, *i.e.*, an egg of a blackbird, from which I removed two almost fully-developed chicks, the other being that of a robin. It is a large handsome shell, and contained two yolks. These eggs I consider to be the greatest curiosities I have.

The pheasant occasionally produces some curious zoological specimens, some being about the size and shape of acorns, others almost round, varying in size from moderate-sized grapes to fairly large ones. These are generally of a rich colour. The red-legged partridge occasionally lays a small rough egg with a collection of small spots on one end. The common partridge has given me but one pygmean specimen; it is the most perfect miniature egg I have ever seen; it contained nothing but albumen. Pygmean eggs of this bird must be very rare, or I should most certainly have met with more of them. Nevertheless, those who have had the same opportunity of observing may have met with them more frequently.

Mr. Wright mentions that small globular spotless eggs of the song thrush are not infrequently met with, also eggs having the spots and markings agglomerated into blotches on the large end. In this case my experience goes exactly in the opposite direction, for I have never met with a pygmean egg of the thrush, neither have I ever been able to obtain any of the eggs with the spots and markings agglomerated into large blotches, although I have every season been on the look-out for them since Mr. Hancock showed me some specimens, and that is now more than twenty years ago. If it is not unusual to meet with them in Mr. Wright's collecting area, it tends to prove that certain departures are restricted to certain localities. The only sport I have met with in the eggs of the thrush is an egg in a clutch of five, which in the place of black spots has a number of rough patches of pale rust colour dispersed over the shell. I have two good specimens of blackbird eggs with the colouring matter forming a cap to the large end; these are the only specimens I have ever seen. It is difficult to know when to stop writing on this interesting subject, as many more departures may be added to the foregoing, and I may, perhaps, be considered a pessimist when in bringing this paper to a close, to express a fear that but few collectors will take the trouble to record the curious facts and irregularities they have met with.

JOSEPH P. NUNN.

Royston.

TWO NEW SPECIES OF ROTIFERA.

By DAVID BRYCE.

I.—METOPIDIA RHOMBOIDULA.

DURING the months of November and December last, I found a series of specimens of a very beautiful species of Metopidia, which I believe to be undescribed, and to which I venture to assign the above specific name, together with the following characters:

Lorica rhomboidal in dorsal view, the lateral angles slightly rounded, and the posterior nearly a right angle; anteriorly slightly notched, and rising into an acute medio-dorsal ridge, extending to posterior angle and arched longitudinally; ventral surface nearly flat.

The species might easily be passed over as *M. triptera*, if imperfectly seen, as, although it is slightly broader in proportion and a shade larger,

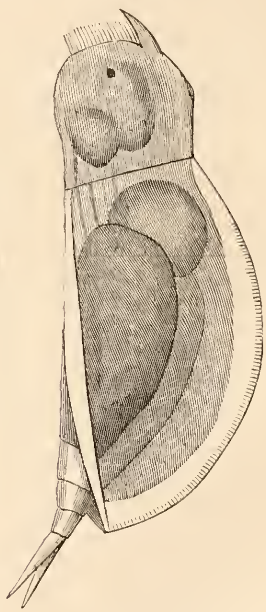


Fig. 41.—Dorsal aspect of *Metopidia rhomboidula*.

it possesses the same extreme delicacy of structure and the same glassy transparency of lorica, and further, when swimming it constantly revolves slowly on its long axis, and so presents in succession the same bewildering variety of aspects. But when quietly gliding over the floccose sediment, it is sometimes possible to get a direct vertical view, and it is at once seen that in place of the lorica being in that aspect almost of the same outline as that of *M. lepadella*, it is nearly of the same shape as the familiar ace of diamonds, having four sides practically straight for the greater part of their respective lengths. The lateral angles are rounded off, and in the front, the lorica rises into a sharp ridge, which is continued along the centre of the dorsum as far as the posterior angle and gracefully arched. A delicate milling is visible just within the edges of the lorica and of the dorsal ridge, being most apparent near the posterior angle and dying away after passing the lateral angles and the crest of the ridge. It is easily distinguished from *M. rhomboides*, the dorsum in that species being tectiform, not ridged.

The head is furnished with the usual plate: two eyes are distinct and a minute pimple-like antenna is visible in a side aspect. The internal organs are very delicate, and I have not yet succeeded in tracing out the gastric glands and the contractile vesicle. In several specimens the ovary was well developed, and in addition a large egg was conspicuous in the body cavity. The foot and toes appear to be normal in structure. Length, about $\frac{1}{210}$ inch.

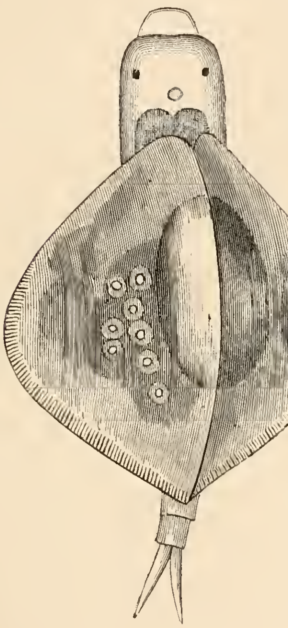


Fig. 42.—Ventral aspect of *Metopidia rhomboidula*.

Some six or seven specimens have occurred in some stock jars, containing anacharis, confervæ and watermoss from a very prolific ditch near the Lea.

The same ditch has repeatedly furnished specimens of *M. rhomboides*, *triptera* and *oxysternum*, all so-called rare species, in addition to the common *M. lepadella*, *bractea* and *solidus*. *M. acuminata*, has also occurred, but is in my experience the most rare of those named. The present species appears more given to swimming than its congeners, and I have but seldom seen it gliding over confervæ or on the glass sides of my troughs. My sketches are from the last specimen found, which I succeeded in mounting in fair condition. Allowance is, however, to be made for undue protrusion of the head and neck, consequent upon the swelling of the body, before the preservative solution employed had stiffened the membranous integument and muscles. I have not been able to secure such a sketch as would enable me to give an accurate transverse section, but I believe that shown in fig. 43 to be nearly correct.

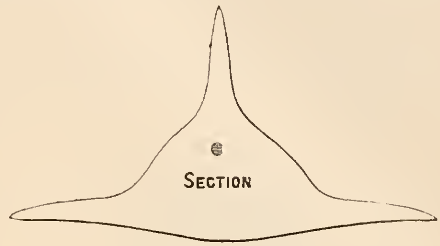


Fig. 43.—Section through *Metopidia rhomboidula*.

In this species, at all events, the milling above referred to appears to have no connection with that faint wavy line visible in most specimens of Metopidia, which indicates either the line of fusion of the plates of the lorica, or the edge of the lining membrane.

2.—Euchlanis subversa.

Spec. Char.—Lorica broadly ovate; ventral plate considerably larger than dorsal, the sides much bent upwards; dorsal plate of similar outline, nearly flat, but having a central longitudinal depression, save near anterior margin where it rises to a slight convexity. Both plates anteriorly truncate, straight or slightly excavate, dorsal occipital edge joined to head by a membrane. Foot apparently without setæ, toes long, of uniform thickness, slightly out-curved.

A single specimen of this handsome species was found on 28 September in a gathering from the ditch referred to in preceding description, and was, after a long interval, followed by a second about the end of December.

The sketch (fig. 44) made from life, of the earlier specimen, will be found on comparison, very like indeed to the figure in Hudson and Gosse's Rotifera of the dorsal view of *Diplois propatula*, but the characters presented by my specimen differ very materially from those assigned to that species.

The present form is, as I have desired to indicate by the specific name, an Euchlanis upside down. For not only is the ventral plate considerably the larger, but it is also strongly turned upwards at the sides, forming a rounded keel, and the dorsal plate, smaller but of similar ovate outline, is at its occipital edge slighly arched for the protrusion and retraction of the head, but immediately behind sinks in a shallow longitudinal depression.

The plates are separated by a broad and deep sulcus, and held together by a stout membrane.

(The hypothetical cross section (fig. 45) will save much explanation. I believe that, if anything, the lower plate rises more nearly to a level with the dorsal than I have shown.) I was unable to make out that either of the plates were infolded, and, having but one specimen, I dared not make use of caustic potash to solve the comparatively unimportant point. On looking at fig. 44 (dorsal view), three moderately conspicuous lines are seen. The outer line, broken only by the superposition of the foot, is the edge of the ventral plate, the next line, unbroken and therefore above the foot, is the edge of the smaller or dorsal plate, and the V-shaped inmost line is the optical presentment of the fold in the membrane connecting the two plates (as at the point D of transverse section). On reference to *Diplois propatula* in the figure of which all three lines will be seen, Mr. Gosse will be found to state that the V-shaped line seen by him is the edge of a cleft in the larger or dorsal plate of that species, and it is principally on account of this cleft, that he places the species in the genus Diplois and in the family Salpinadæ. In my specimen, although the lines are equally visible, I

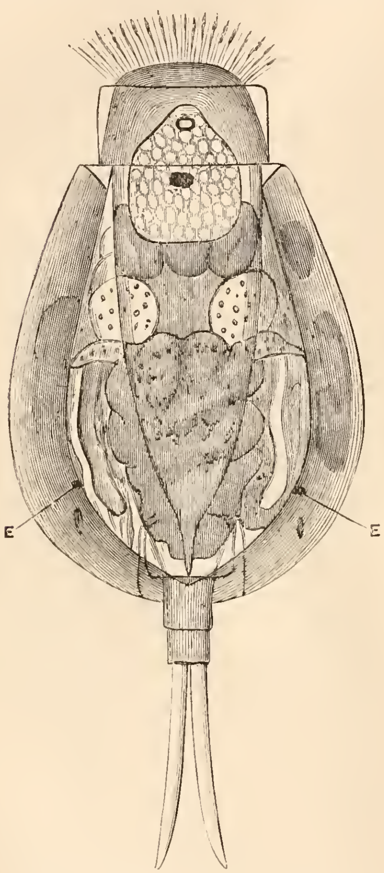


Fig. 44.—Dorsal view of *Euchlanis subversa*.

satisfied myself by careful and repeated observation with the highest combination at my command (quarter inch obj. C eyepiece) that there was not cleft on either the dorsal or ventral plate. I could easily focus organs lying above, and organs lying below the level of the V-shaped line. That the smaller plate was the dorsal was proved by the presence of the brain and dorsal antenna on the same level.

There was equally the appearance of three spines at base of foot. These, on minute examination, were also found non-existent. The centre spine is the optical presentment of an acute angle formed by the attachment of the membrane aforesaid to the dorsal plate, being in fact the point of the V; the outer pair seemed to me to be two little flanges arising from the ventral plate and probably a side protection to the foot, which further is protected above by a small sub-square plate.

The toes in my specimen are long, slender, rod-like, and slightly out-curved, agreeing thus with Dr. Collins' specimens of *Diplois propatula*. The brain was large, composed of many round globule-

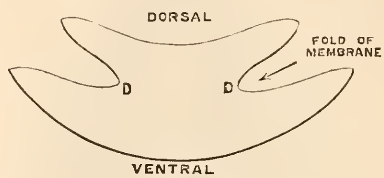


Fig. 45.—Hypothetical transverse section of *Euchlanis subversa.*

like cells, fairly transparent, and the eye, seated upon the inner side of brain, had the appearance of two eye-specks partially fused into one. The dorsal antenna was distinct at anterior point of brain.

At the points marked EE I thought I could distinguish two minute oblong openings bounded by a slightly thickened ring of harder substance than the membrane adjoining. Length, including toes, about $\frac{1}{70}$ inch.

The divergence from Mr. Gosse's description was so marked whilst the animal, viewed dorsally, so much resembled his figure, that I thought it well to submit my observations to Dr. Hudson, and I proposed to him in a letter written early in October that the species should be transferred to the genus Euchlanis. In his reply he informed me that he had not himself seen the species, and suggested that, to avoid confusion, my specimen should be described under a new specific name. I made further fruitless enquiry as to the occurrence of *Diplois propatula*, and finally sent to SCIENCE-GOSSIP the short request printed on page 41 (February 1890). On its appearance I was at once favoured with a communication from Mr. Percy Thompson. In brief he was able to tell me that on 19th October he had found, examined, sketched and described in notes, a specimen agreeing in every important detail with mine. I am further informed by Mr. Western, that he and Mr. Chapman, whilst very recently examining a specimen (I presume from Esher) have found the larger plate to be the ventral.

A moment's consideration of the peculiar and unusual structure of the lorica and of the confusing appearances produced by each change of position of the living animal, enables one easily to comprehend how such an experienced and so careful an observer as Mr. Gosse might possibly have been deceived in his interpretation of such difficult characters.

In any case, his species *Diplois propatula* must remain on the list, albeit I take it to be somewhat doubtful.

In the February issue of SCIENCE-GOSSIP appears a notice by Dr. Barnett Burn of *Diplois propatula*. I should have judged that his specimens were similar to mine but that he follows Mr. Gosse, in showing the larger plate as the dorsal.

37 *Brooke Road*, *N.*

JOTTINGS CONCERNING CERTAIN FRUIT TREES.

By MARY B. MORRIS.

PART VI.—THE CHESTNUT TREE (*Castanea vesca*).

THIS tree, said to derive its name from the town of Casthanea, at the foot of Mount Pelion—a locality where it still abounds—has a very widely extended natural habitat, being found apparently wild in extremely distant regions of the earth. There are whole forests of it in most of the mountainous regions of the temperate zone, around the Caspian Sea, in Portugal, Algeria, and on the frontiers of Tunis, whilst in America it is found wild in great abundance in the high mountainous parts of Virginia, the two Carolinas, and Georgia; but no further north than New Hampshire. Some there are who maintain that the American species is a different one from that growing in Europe; but there seems to be but little ground for this opinion.

The Romans in Pliny's time were wont to count eighteen varieties of chestnut, but they accounted the best those trees which came from Sardis and from the Neapolitan country; and, according to this writer, the chestnut was sometimes called by the Greeks the "Sardian acorn," because it was first introduced to them from Sardis. It had also another name given it, at a rather later date, namely that of "Dios balanion," Jove's acorn, but this was after the fruit had been greatly improved by cultivation. Besides this, the Romans called what seems to have been another variety, with a roundish fruit, Balanitis or acorn chestnut. By all we can gather from ancient authors, both Greeks and Romans held the fruit in high esteem as food, and valued the tree also for its timber. Chestnut trees often attain to a great age as well as gigantic size. In proof of the former statement, it may be mentioned that some of the very trees with which Pliny was familiar are believed to be still in existence; there being forests of wild sweet chestnuts on Mount Etna, many trees amongst them bearing evidence of great age, and being remarkable for their enormous size; notably one, known as "the hundred-horse chestnut," a name given to it from its being capable of containing a hundred mounted men within its hollow—its circumference measuring above one hundred and sixty feet.

In the Department of Cher, near Sancerre, are also some very large and ancient specimens of this tree; one which, from records still existing, was, above six hundred years ago, known as "the great chestnut," and at six feet from the ground measured above thirty feet across, was, a few years since, reported quite sound. The age of this tree is computed to be at least a thousand years. Pliny evidently looked upon the fruit rather as a "much ado about nothing," since he writes of it, "The chestnut has its armour of defence, in a shell bristling with prickles like the hedgehog. . . . It is really surprising that nature should have taken such pains thus to conceal an object of so little value; we sometimes find as many as three nuts beneath an outer shell. . . . Chestnuts are most pleasant eating when roasted; they are sometimes ground also, and eaten by women when fasting for religious scruples, as bearing some resemblance to bread." We read of other kinds as being grown to feed pigs; but in all probability these were the horse-chestnuts. We glean some amusing directions with regard to the propagation of the tree, which we are told may be reproduced from the nut, the largest only being suitable for sowing, and then only in "heaps of five." They are to be planted with twelve inches between them every way, and the holes in which they are placed should be nine inches every way. There seems to have been considerable pains taken at the period referred to for the improvement of the fruit. One account says, "We must not omit here one very singular circumstance. Corellius, a member of the Equestrian order at Rome, native of Ateste, grafted a chestnut in the territory of Neapolis with a slip of the same tree, and from this was produced the Corellian chestnut, which is so highly esteemed, and from him has derived its name. At a later period, his freedman Etereius grafted the Corellian chestnut afresh. There is this difference between the two—the Corellian chestnut is more prolific, the Etereian of superior quality." The chestnut tree was valued then as now for its poles—the wood being said to be better than any for "stays or poles for vines," being more durable than any, and "the tree will shoot again." Columella directs that chestnuts be sown thickly, to prevent accidents, and where plantations of them are made by seed now this precaution is taken, in order to provide against the depredations of rats and mice, who find the sweet nuts a toothsome morsel.

Our ancient authorities, however much they may have esteemed the tree and its fruit—which latter they credited with having some healing properties and having "a tendency to make flesh"—seem to have known nothing of it as a staple article of food, such as it has since been throughout Spain, the south of France, Italy, and Southern Europe generally, where it is eaten raw, roasted, ground to flour, or otherwise prepared as an article of daily diet, for which purpose its cultivation has been carefully promoted and practised for many centuries.

There is a passage in a work by Oliver de Serres, written in the sixteenth century, in praise of the Sardian and Tuscan chestnuts, which answer to the description of those now so largely grown and carefully harvested throughout Dauphiné and also in Var au Luc; these fruits are called "Marrons de Lyon." This is probably the same species as that referred to by the Italian Targione in 1170, who informs us that the "marrone" or "marone" was extensively used in Italy in the Middle Ages. Another authority states that in 1686 Perigord, Limosin, and Auvergne were so full of forests of chestnut trees that the common people had no other food all the year round; adding, "so they can afford to work very cheap, and do for next to nothing; they drink water." It is, however, not the wild Castanea which furnishes the nuts that are principally consumed in the south of Europe and exported to more northern countries, but cultivated varieties, whose nuts are both larger and sweeter than the wild.

It is difficult to say when the chestnut tree reached England, so long has it been naturalised in our woods; and in olden times, if not now, it grew to considerable size, so that its timber was used for building. Of its wood many suppose the roof of Westminster Abbey and the Church of St. Nicholas, Great Yarmouth, whose date is of the time of William Rufus, to be built, though we must allow other authorities state them both to be built of a species of oak (*Quercus sessiflora*). However this may be, no chestnut timber has been used for building in England for above two hundred years. The wood is extremely hard and durable, as the writer can testify, from the fact of the great difficulty experienced in piercing a beam in her own house some few years back. This beam had to be bored for the passage of an ordinary gas-pipe, and for a time it defied the strength and skill of a clever mechanic, who pronounced it the hardest and soundest beam he had ever met with. The house had then been built above two hundred years.

Many of our writers upon forestry have descanted upon the chestnut and its charms; only old Nicholas Culpepper dismisses it summarily, probably because it did not subserve either his astrology or his physic. "It were as needless to describe a tree so commonly known as to tell a man he hath gotten a mouth," says he. Evelyn, on the other hand, in his delightful "Sylva," commends to us "those of Portugal or Bayonne, choosing the largest, brownest, and most ponderous for fruit, such as Pliny calls Coctivæ; but the lesser ones for raising timber." To test the nuts for seed, he recommends the "water ordeal," and counsels to "reject the swimmers"; the nuts to be then again dried for thirty days, to go through a second water ordeal, and then to be planted, "point upmost, as you plant tulips." He adds, "Pliny will tell you they come not up unless sown four or five in a hole; but this is false, if they be good, as you may presume all those to be which pass the examination. If you design to set them in winter, I counsel you to inter them within their husks, which, being every way armed, are a good protection against the mouse, and a providential integument. Pliny, from this natural guard, concludes them to be excellent food, and doubtless Cæsar thought them so, when he transplanted them from Sardis, first into Italy, whence they were propagated into France, and thence among us—another encouragement to make such experiments out of foreign countries."

"The chestnut is, next the oak, one of the most sought after by the carpenter and joiner. It hath formerly built a good part of our ancient houses in the city of London, as doth yet appear."

"I had once a very large barn near the city, framed entirely of this timber, and certainly the trees grew not far off, probably in some woods near the town; for in the description of London, written by Fitz-Stephens in the reign of Henry II., he speaks of a very large forest which grew on the boreal part of it. A very goodly thing it seems, and as well stored with all sorts of good timber as with venison and all kinds of chase; and yet some will not allow the chestnut to be freeborn of this island, but of that I make little doubt." After recommending the poles for stakes and palisades, and for "pedaments" for vine props and for hops, our author goes on to discover certain moral characteristics of the tree. "I cannot celebrate the tree for its sincerity; it being found that, contrary to the oak, it will make fair show outwardly, when it is all decayed and rotten within; but this is somewhat recompensed, if it be true, that the beams made of chestnut tree have this property—that, being somewhat brittle, they give warning, and premonish the danger by a certain crackling, so as, it is said, to have frighted those out of the baths at Antandro, whose roof was made with this material."

Bemoaning our English extravagance, he further writes: "But we give that fruit to our swine in England which is amongst the delicacies of princes in other countries, and, being of the larger nut, is a lusty and masculine food for rusticks at all times, and of better nourishment for husbandmen than *cole* and rusty bacon, yea, or beans to boot; instead of which they boil them in Italy with their bacon, and in

Virgil's time they ate them with milk and cheese. The best tables in France and Italy make them a service. It Italy also they boil them in wine, and then smoke them a little; these they call *anseri*, or geese, I know not why. . . . The bread of the flour is exceeding nutritive; it is a robust food, and makes women well complexioned, as I have read in a good author; and a decoction of the rind of the tree tinctures hair of a golden colour, esteemed a beauty in some countries. . . . How we here use chestnuts in stewed meats and beatille pies our French cooks teach us."

There still exist some remarkable specimens of the chestnut tree, whose age and size are very notable, but none of these, perhaps, save one can boast of having saved the life of a man. There is a celebrated one in the Jardin des Tuileries, which bursts into leaf earlier than any of its neighbours, usually by March 1st. The story runs that a celebrated painter, Joseph Vien, was accused of having assassinated his rival at the Royal Academy on March 20th, 1746. Vien proved before the tribunal that at the moment of the murder he was standing talking with the Duchesse de Ronceraux under a chestnut tree. He said he could identify the tree, for it was the only one in leaf. This *alibi*, we are told, saved the painter's head, and from that time the precocious tree has been noted. It seldom fails in its early leafage; the extreme cold of some years occasionally delays it a little.

It has been stated that we no longer use the wood of the chestnut for building; but its timber is found very durable where exposed to the action of water, and for this reason is still used in water mills. The wood also makes one of the best kinds of charcoal. A special use of the wood which may be mentioned is in the little musical instrument called "Castanets," whose name indicates the material of which it is made, or perhaps one should say was originally made—bone or ivory being now often substituted. The Moors, however, who were its first inventors, made it of the wood of the chestnut tree.

NOTES ON NEW BOOKS.

A NATURALIST'S VOYAGE ROUND THE WORLD, by Chas. Darwin, F.R.S., &c. (London: John Murray). This is an edition de luxe of the first work written by our great naturalist. Anybody who has read it is not likely to have forgotten it. It is a kind of natural history "Robinson Crusoe." It was during that famous voyage that Darwin made the observations and laid the foundation for his famous theory of Natural Selection. The present edition is by far the best and most attractive hitherto published. The illustrations are artistic in the highest degree, as everybody will understand when he knows they are by the artist of Lady Brassey's "Sunbeam." Most of them are from sketches made on the spot by Mr. Pritchett, with Darwin's book by his side.

Physiology of Bodily Exercise, by Fernand Lagrange, M.P. (London: Kegan Paul & Co.). This is a new volume of what is fairly entitled to be called the celebrated "International Scientific Series." As its title imports, it is devoted to what may be termed a new science—that of athletics or bodily exercise. For this reason it commends itself to the attention of all athletes; or, for the matter of that, the larger number of people who have come to see there can be no long continued good health without exercise of some kind. Dr. Lagrange is perhaps the best medical authority on the subject, so that whatever he says in this respect is entitled to attention. The book is one that ought to be read by all schoolmasters and schoolmistresses in particular, to whose notice we would strongly commend Part vi., on the "Office of the Brain in Exercise."

Foods for the Fat, by Dr. N. E. Davis (London: Chatto & Windus). This is a useful little treatise on how to cure corpulency. The author is of opinion that a sound constitution and a lithe and active frame are necessary to good health, and that corpulency tends to curtail not only perfect health, but many of the pleasures of life. In other words, he regards corpulency as an insidious disease. Dr. Davis not only describes this disease, but, what is more important to corpulent people, gives quite a cookery list of dishes, all of them tempting, and the consumption of which would reduce corpulency.

The Reign of Law, by the Duke of Argyll (London: John Murray). The noble author has been a man of war from his youth. He is now vigorously fighting in the columns of "Nature," Professor Ray Lankester, Professor Dyer, Herbert Spencer—any one who comes first, like Hal o' the Wynd! Twenty-five years ago, he combated Darwinism in the chapters forming the present volume, after his lively and entertaining fashion. His efforts have not been in vain, as is proved by the fact that this is the nineteenth edition.

Handbook of England and Wales (London: John Murray). This is the second edition of one of the most useful works of its kind ever issued. It seems a pity its clever original compiler could not see his book so practically appreciated. There is no better or handier book for foreigners; and very few more instructive or entertaining work for Englishmen who take an interest in the topography and archæology of their own land.

A Catalogue of British Fossil Vertebrata, by A. Smith-Woodward and C. D. Sherborn (London: Dulau & Co.). Both the authors of this valuable work of reference are young and rising men of science. Our readers have read many papers in our own columns by Mr. Woodward, and will, therefore, be fully prepared to admit his fitness to be the author of a book like the present. It does for fossil vertebrates what Woodward and Morris did for invertebrates. The amount of work it includes is enormous. There is not a fossil vertebrate left unnoticed that we have found; whilst the bibliographical references to all are full and accurate. It is a monument of patient scientific industry.

Index of British Plants, according to the London Catalogue, by Robert Turnbull (London: George Bell & Co.). This prettily bound brochure is the eighth edition of one of the most useful books a botanist could procure. It includes the synonyms used by the principal authors, an alphabetical list of English names, and full references to the illustrations of Syme's "English Botany," and Bentham's "British Flora."

Notes on the Pinks of Western Europe, by F. N. Williams (London: West, Newman & Co., Hatton Garden). Mr. Williams is well known as a highly competent authority on the subject which forms this handy and compact little monograph. It will be found exceedingly useful to students of this beautiful group of plants.

We have also received *The Medical Annual* for 1890 (Bristol: John Wright & Co.), which has grown in bulk and usefulness every year since it was started eight years ago, and has attained its highest development in the present well-got-up volume. It is now a capital book of reference for all medical practitioners, and is contributed to by the leading men of the day in their particular profession. Also *The Educational Annual*, compiled by Edward Johnson (London: Geo. Philip & Son), a handy reference to all our Public Schools and Colleges, and a Review of the position and progress of Elementary, Intermediate, and University Education. Everything that can by any possibility be associated with education in any form has been usefully and compactly brought together in this volume.

Potential and Its Application to the Explanation of Electrical Phenomena, by Dr. Tumliez, translated by Dr. D. Robertson (London: Rivingtons). This is a clear and well-done translation of a little book that cannot but prove very useful to all students of physics, whilst to students of electricity pure and simple it will be of the highest value.

Science and Scientists, by the Rev. John Gerard, S.J. (London: 18 West Square, S.E.). This is a small but well-bound collection of the tracts we have already noticed. Mr. Gerard knows his subject, and is no mean antagonist. This little book exhibits undoubted evidence of wide reading, although we could have wished it had led to broader conclusions; it is a highly readable little volume.

North American Birds, by H. Nehrling (London: William Wesley & Son). Parts one and two, price five shillings each. This work will be one of high value to American ornithologists, and one that all European ornithologists also would do well to take in. It is to be completed in twelve parts, and will be illustrated by thirty-six highly coloured plates. Judging by those in the present number sent us, these will be highly artistic. That forming the frontispiece is admirable. It is the picture of the male and female of Anna's humming bird (*Trochilus Anna*) with the pretty nest and eggs on a branch of some favourite tree. Some of the plates figure six different species. All are well drawn and coloured.

We have received numbers one and three (number two has not been sent) of a *Handbook of Scientific and Literary Bible Difficulties*, edited by the Rev. Robert Tuck (London: Eliot Stock). It is an admirable work for young Biblical students and Sunday school teachers, dealing ably with solutions of perplexing things in the Bible.

ANIMALS AND MEDICINE.

By Hulwidgeon.

"The proper and chief end of true natural philosophy is to command and sway over natural beings, as bodies, medicines, mechanical works."—Bacon.

If asked to decide which of the old "natural kingdoms" had been most subsidised by the apothecary, one would probably answer either the vegetable or the mineral; and yet, when one comes to examine the history of medicine, he is not so sure that the Animalia has not been called into contribution in excess of them both. Further, it seems to me, after a long survey of the records of ancient physic in England, that, great as has been the immolation of living creatures at the altars of our appetites, defence, and sport, the sacrifice at the shrine of medicine, at least in the past, has equalled any. The butcher (using the term in the general sense of one who provides us with animal food) has been satisfied with slaying those creatures whose flesh would afford us nutriment; the apothecary, not content with such, has carried its depredations through every known order of the animal kingdom; the past and the present, marine and terrestrial, living and dead, virulent and innocuous, mean and gigantic, he has dragged them all into his laboratory, and, with stills and retorts, crucibles and alembics, has reduced them all to the common dead level of his vehicles of pharmacy.

An inquiry into the full extent of the debt the art of medicine owes to the science of zoology would be a work of such magnitude, that I shall confine my remarks to one era only in their joint history, with a little licence, to the eighteenth century. For the selection of this period I have several sufficient reasons. As I am not a medical man, I should not wish to be responsible for the publication of recipes that might be practically tested, nor of views that might give rise to controversy; I shall make my discourse, therefore, entirely retrospective. The era with which I shall deal was probably that in which the art of medicine took its greatest progressive stride.

The real science of pharmacy in all likelihood, dates from a period embraced in that I shall treat of; and one must leave to the antiquarian the consideration of the antiquated prescriptions of a date prior to this. Indeed it is chiefly to the lover of nature (as the stand-point from which I write) that I address these remarks, in the hope that I shall interest him with an array of curious information on the economic purposes to which his subjects were submitted in times past, and the queer notions that men of education held with regard to them little more than a century ago.

The sources of my information have been many and representative. I shall have occasion to quote from a variety of books, mainly from those of the widest popularity, and in the hands of nearly every accredited practitioner of physic in their time; works that were then considered of reliability and put to frequent application. To facilitate reference to those I shall quote from most often, I shall add a few words on my chief authorities.

The "Pharmacopœia Bateana" or "Bate's Dispensatory" (a volume of 700 or 800 pages) was translated by Wm. Salmon, M.D., from Jas. Shipton's Latin version of the celebrated Dr. Bate's autograph prescriptions. Bate had been "physician to two Kings of England and a Protector," and Salmon, as himself a practical physician, added sufficient original matter to entitle the book to be regarded as a compendium of the medical knowledge of his day. It ran through several editions, and to the latest of these, corrected by the original editor and dated 1713, I shall frequently refer, under the recognition of "Bate" when I quote from the original, and "Salmon" when I use the observations of his editor—a peculiar conjunction of names. This will be my chief authority for the beginning of the century.

The English translation, by Mr. Humphreys, of the Abbé de la Pluche's celebrated "Spectacle de la Nature" (5th edition, 1740), will serve to explicate deficiencies of zoological knowledge. I shall refer to it as "Nature Display'd."

That justly classical work, the "Domestic Medicine" of Dr. Buchan (M.D., F.R.C.P., Edin.), which ran through upwards of twenty English editions in forty years, and was certainly the most popular work of its kind ever written, will furnish evidence of that revolution in the medical art which abolished the prescription of heterogeneous compounds in favour of "the prevention and cure of diseases by regimen and simple medicines." Mine is the complete edition of Dr. Nisbet, 1813, but as the book was first issued in 1770 (its author dying in February, 1805, as his tomb in Westminster Abbey bears witness), it comes well within the period under consideration. I shall acknowledge excerpts as "Buchan."

Another work from which I will draw is the "Medical Dictionary" of Robt. Hooper, M.D. (1811), which superseded the "Lexicon Medicum" of Quincy, and will bear true witness to the state of medicine at the close of the age I deal with. I shall refer to it as "Hooper." It is noteworthy that Hooper, in his list of the fourteen most noteworthy British and foreign Pharmacopœias (p. 614), includes the *P. Bateana* with which I have commenced. Of these and a score of works of lesser note I have read every word, to have a thorough handling of my subject.

My scheme in the following papers shall be to deal methodically with the animalian orders, taking them in rotation. I shall devote perhaps half-a-dozen chapters to the Mammals, another to the rest of the Vertebrata, and a last to the Invertebrates.

I.—Primates.

The principal corporal provision to the laboratory, from the leading order of creation, was—incredible as it may seem nowadays—two centuries ago obtained from that single species of the *Bimana*, *homo sapiens* himself! Perhaps I ought to say him and herself, for female bodies were greatly utilised by man; indeed, almost every portion of his structure had a remedial value, even the evacuations and humours of his system being supposed to possess a curative virtue. The prescriptions in which these somewhat loathsome ingredients were included are so numerous that I shall quote only some of the most remarkable of the least objectionable.

Human bones were of the commonest occurrence, a fanciful preference being held for those of the skull.

Bate (p. 631) includes "calcin'd man's bones" among the composition of his *Pulvis hermadactylorum compositus*, which Salmon prescribes every third or fourth day for scurvy, dropsy, and king's evil.

Salmon (p. 39) includes "elixir of man's skull" in his "spirit of black cherries," which was to be administered "morning and evening for two months together" against falling sickness, although "the usual way of exhibiting these kinds of medicaments is only three days before and after the full and change of the moon." Another of Salmon's recipes (p. 361) for falling sickness was taken from Mynsicht, and required one ounce of "man's skull filled (? filed) or calcined without fire." Sennertus, in the same medicament, employed cinnabar of antimony, "crude man's skull and magisteries of coral and pearls" in equal proportions.

For epilepsy, apoplexy, and some uterine disorders, Salmon gave two to four grains of "salt of man's or beast's skulls," in one ounce of Bate's *Syrupus lumbricorum* (of which later) at bed time. It was also "said to be a specifick against rheumatisms" (p. 597). An epileptic powder of Bate's (p. 629) contains pulverised human skull: Salmon asserts that this powder cured venomous bites. Another epileptic powder of the latter (p. 627) is furnished with volatile salt of man's skull as an improvement on a recipe of Bate's. Salmon also adds the same and other ingredients to Bate's *Electuarium epilepticum* (p. 645).

One of the strangest of these human compositions was that vaunted catholicon of the famous W. Goddard, "a great philosopher and physician who deserv'd well of the world in his days and time, and who has, even in this remedy, left himself an immortal name. And this is the true medicine which was purchas'd of the doctor by King Charles the Second, so much fam'd through the whole kingdom, and for which he gave him, as it is reported, many hundred pounds sterling." By the publication for the first time of this renowned prescription, Salmon considered he conferred a great "obligation upon the generous lovers of art"; a set-off indeed to the revelation of their other arcana in the vulgar tongue. The original preparation (p. 136) of the *Guttæ Goddardianæ* (or Goddard's drops) was to:—

R.* human bones or rather skulls, well-dry'd, break them into bits, . . . and distil first with a gentle fire, then with a stronger, increasing the fire gradation; so will you have in the recipient a flegm, spirit, oil, and volatile salt. . . . Set it in the earth to digest for three months, after that, digest it in a gentle heat fourteen days, then separate the oil, which keep for use."

Salmon, improving on this, as was his wont, continued: "You may make it of all the bones of the human body together; or if it be for a particular intention, as for the gout in any limb, then of the bones of those parts; † but if for diseases of the head, then of skulls only. And you ought to chuse those bones which have lain a long time a-drying, for that they will have lost most of their flegm. . . . These drops are of an ill and fœtid smell; but, being made of skulls, are an excellent thing against the falling sickness, apoplexy, lethargy, vertigo, megrim, head-achs, carus, palsies, convulsions, and most other diseases of the head, brain, and nerves. . . But if you would take away their evil scent and elixirate them [by dissolving them in spirit of nitre and leaving to digest a month in four times the weight of alcohol], so you will have a medicine beyond all comparison, ten times exceeding the other in worth and efficacy."

Goddard's dose was six to twelve, or even, "in extremity, to twenty drops, in any proper vehicle." Salmon, who afterwards made a still pleasanter and *more efficacious* oil, "as I by a long series of experiments can truly tell," gave of his previous remedy twenty to forty drops, "in a glass of canary in the morning, fasting, a little before dinner, and last at night, going to bed." May good digestion and pleasant dreams have waited upon it!

Human blood was another favourite remedy, that of young men physically healthy having the preference. The *Decoctum ad Rachitidem* (p. 586), given to children for the rickets, contained ten drops of "spirit of man's blood" to the dose. Bate's *Spiritus sanguinis* (pp. 63-5), a distillation of the blood "of a sound young man," was, says Salmon, when mixed one dram to two or three ounces of "water of earthworms, lilly convally and lavender or peony," "that spirit so much cry'd up for the cure of the palsy, being inwardly taken six to twenty drops in broth, decoction or generous wine." There were a variety of forms of this medicine, and in any of them the blood of certain other mammals, "sheeps, goats, swines or neats," to wit, could be substituted "in defect of man's blood . . . for in perfect animals the natural digestions are perform'd in the same manner and their blood is endowed with nearly the same virtues, save that human blood may be thought to be more homogenial to our natures."

Human fat was not neglected either. The *Balsamum spinale* of Bate (p. 685), to which I shall refer later, required four ounces of "man's grease," and was applied "on the *spina dorsi*, or back bone, for the rickets."

More than this, the apothecary of old went even further afield for his human *materia* than to the graves and charnel-houses of his own time. During the preceding century Sir Thomas Browne had alleged "that the mummy is medicinal the Arabian doctor Haly delivereth and divers confirm; but of the particular use thereof is much discrepancy of opinion." While Hoffmannus prescribes the same to epileptics, Johan de Muralto commands the use thereof to gouty persons; Bacon likewise extols it as a styptic, and Junkenius considers it of efficacy to resolve coagulated blood." Nor had it gone out of fashion when Salmon's "Pharm. Bat." was published. For instance (on pp. 270-1) the editor gives the recipe of "a famous, great and most powerful anodyn," yclept *Laudanum sine opio*, which required, among other components, upwards of half a dram of an Egyptian mummy.

Perhaps the most curious of these strange medleys was that of the greatest repute and least practical value. Bate's *Unguentum sympatheticum* was an ointment of half an ounce each of oil of roses and fine bole, two ounces of linseed oil, one ounce each of "man's grease, moss of a man's skull killed by a violent death, in powder, [quarter ounce each of] mummy, man's blood; mix and make an ointment. By this ointment all wounds are healed, anointing the instrument by which the wound was made once a day, every day if the wound be great; otherwise, if the wound be small, once every second or third day may suffice. The weapon is to be kept wrapt up in a clean linen cloth and in a place not too hot, lest the patient suffers thereby." Salmon tells us this is abstracted "exactly from Barbet; [but is] said to perform the cure, provided," he cautiously adds, "the

* Recipe = take of.

† i.e. from parts similar to those affected.

nerves or arteries or some principal member be not hurt." One may take it that wounds which do not injure an artery or nerve are so trivial that they do not require attention.

But all these whimsical prescriptions gradually fell out of the Pharmacopœias. Howard's Dictionary (1790) still repeated the *Guttetæ pulvis*, an epileptic powder almost identical to those I have quoted, from the Paris Pharmacopœia. It contained in its medley of ingredients, coral, gold-leaf, "the horns of elk's-foot" and "human skull." Howard says it "has been deemed a very powerful antispasmodic, and is said to have been administered for a considerable time with great success in the epilepsy." It was, thus apparently credited within a hundred years of to-day. And at the end of the century we do not find one left, though they undoubtedly lingered, and some of them may be practised still, among those unqualified practitioners whose superstition fills the place of knowledge.

Human milk was used as a nutriment in wasting diseases, and Hooper has a great deal to say about its analytical qualities (pp. 498–500). It was included in several older prescriptions.

The *Bezoar microcosmicum*, a calculus found in the human bladder, was reputed to posess alexipharmic virtues.

The Quadrumana contributed nothing I can find beyond the *Bezoar simiæ*. Of these peculiar stones I shall speak generally when I come to the class from which they were mostly obtained.

ILLUSTRATIONS OF VEGETABLE TERATOLOGY.

We are certain that our botanical readers would be doing their science a service by keeping a special look-out during the coming summer for vegetable "freaks," floral or otherwise, and recording the same.

Mr. F. J. Provis sends us the accompanying sketch of a double ox-eye daisy (*Chrysanthemum leucanthemum*), and a double primrose. As he acutely remarks, the latter seems to have half succeeded in becoming an oxlip.

Mr. Edward Bucknell, of Romsey, has also kindly forwarded the drawing of an abnormal growth in *Geum rivale*. He says:—"The whole plant is coarser and more hairy than usual. Flower stalk with a fusiform enlargement at five inches from the ground. At this point there is a whorl of five green leaves of natural appearance. Within this whorl, and crowded around the stalk without orderly arrangement, are what appear to be twelve large petals, in colour, texture, and venation similar to a normal petal, but with crenated upper margins and very long claws. Many of the latter are distinctly hairy at their edges. Ten of these are of the size represented in the sketch; two are half that size and rather greener; several are deeply cleft. Within

Fig. 46.—Abnormal growth of *Geum rivale*.

this second whorl is another consisting of six green bristles, in appearance like the filaments of healthy stamens; no sign of anthers. The flower stalk passes through the centre of this structure, and ends four inches beyond it in two natural-looking buds. On dividing the flower stem vertically, seven of the petal-like processes are found to be attached on one side, and five on the other. The latter side is represented in the sketch."

What botanist who has studied the buttercup family (*Ranunculaceæ*) has not been impressed with the fact that the monstrous or abnormal "freaks" indulged in by members of one natural order actually represent the normal structure in another? In the Ranunculaceæ we have a very great number of departures from the type of *R. ficaria*. Some are without petals, as *Caltha palustris*, the anemones, &c. Others have both sepals and petals, but the former singularly modified and advanced to complex stages, as in the columbine (*Aquilegia vulgaris*), larkspur, &c. In the former we have the well-known spurs developed in the sepals of the calyx. Are these acquired characters? The accompanying illustration proves they are, for here we have a reversion, in the shape of a "sport" to an earlier and simpler stage in the flower's ancestry.

The fact that floral organs (sepals, petals, stamens, &c.) are developed, or are modifications of foliar organs is frequently proved, both ways, by "sports."

Fig. 47.—Abnormal growths of Ox-eye Daisy (*Chrysanthemum leucanthemum*), and Primrose (*Primula vulgaris*).

Figs. 48.—Common Columbine (*Aquilegia vulgaris*). *a*, normal; *b*, abnormal.

Fig. 49.—Abnormal specimen of Charlock (twice the natural size), abnormal.

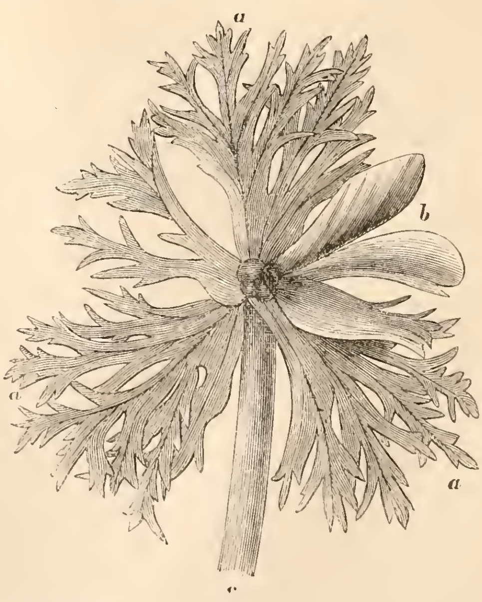


Fig. 50.—Garden variety of *Ranunculus Asiaticus*. *a*, three coloured folioles of the calyx; *b*, the coloured inner foliole or abortive petal; *c*, the foot-stalk.

Here, for example, we have a specimen of charlock (*Sinapis arvensis*) in which almost every flower was foliaceous, the sepals and petals being almost wholly converted back into leaves.

The wood anemone (*A. nemorosa*) is now in flower, and a careful search will be almost certain to reward the young botanist with examples further proving the last stated fact. They will find a specimen like the following, in which one of the leaf-like tracts on the stem has been modified into a nearly fully developed petal.

Garden flowers are especially liable to fluctuating

Fig. 51.—"Monstrous" growth of Peach Flower.

changes. At one time we have petals converted into green leaves—as in the well-known sport called the "green rose." I knew a strain of this monstrosity propagated by cuttings, in which every propagated plant produced them, wholly or in part. Various members of the Rosaceæ are liable to the same floral reversion to foliar conditions. The accompanying illustration of a monstrous peach blossom is an example. Not less interesting, viewed from the point of view that all "freaks," "sports," "monstrosities," &c., are in reality nothing of the kind (the very idea implies lack of wisdom on the part of the Creator), but are reversions to former conditions

Fig. 52.—Abnormal specimen of Wood Anemone.

of some kind or another, is borne out by fig. 50, a garden variety of *Ranunculus Asiaticus*, in which we have a coloured or petal-like foliar organ resembling that in *Anemone nemorosa*.

J. E. Taylor.

ASTRONOMY.

By John Browning, F.R.A.S.

THE annual meeting of the Royal Astronomical Society was held on February 14th. Among other matters, it was stated in the annual report that six minor planets have been discovered during the year. Seven new comets have been observed; three of these move in elliptic orbits.

The report contains obituary notices of Mr. de la Rue, Mr. Newall, Mr. Royston Pigott, Father Perry, Professor Respighi, of Rome, and Professor W. Temple, of Florence. The report refers to Professor Spoerer's researches on sun-spots, which show that a short time before they are at a minimum the spots only appear in low latitudes; at about the time of minimum spots do not appear near the equator, but another set of spots make their appearance in high latitudes, then until the next minimum the latitude of the spots becomes less, and at last the spots only appear near the equator.

Professor Vogel, of Potsdam, has published a most interesting account of the results of observations

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for April.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿ .	2	5 33M	11 40M	5 47A
	9	5 24M	0 3A	6 42A
	16	5 16M	0 30A	7 44A
	23	5 10M	0 56A	8 42A
	30	5 5M	1 15A	9 25A
Venus ♀ . .	2	5 59M	0 45A	7 31A
	9	5 46M	0 50A	7 54A
	16	5 34M	0 55A	8 16A
	23	5 24M	1 2A	8 40A
	30	5 17M	1 9A	9 1A
Mars ♂ . .	2	11 46A	3 55M	8 1M
	9	11 26A	3 33M	7 37M
	16	11 4A	3 9M	7 11M
	23	10 38A	2 43M	6 44M
	30	10 12A	2 14M	6 12M
Jupiter ♃. .	2	3 33M	7 56M	0 19A
	9	3 9M	7 33M	11 57M
	10	2 43M	7 9M	11 35M
	23	2 18M	6 45M	11 12M
	30	1 53M	6 21M	10 49M
Saturn ♄. .	2	2 0A	9 17A	4 38M
	9	1 31A	8 48A	4 9M
	10	1 3A	8 20A	3 41M
	23	0 34A	7 52A	3 14M
	30	0 7A	7 25A	2 46M

he has made of the variable star Algol. It appears that the periodic variability of this star is caused by the revolution of a darker companion eclipsing part of its light. The Professor has calculated that the respective diameters of the two stars are about 1,080,000 and 850,000 miles, that their centres are distant from each other about 3,290,000 miles, and that the orbital velocity of Algol is about twenty-seven, and its dark companion twenty-seven miles, Algol, speaking roughly, being less than half, and its companion less than one-quarter of the mass of the sun.

In April there will be no occultations of any stars of large magnitude, nor any astronomical phenomena of popular interest.

Mercury enters Aries about the 11th, and Taurus about the 23rd, and at the end of the month it is an evening star in Pisces.

Venus is an evening star.

Jupiter is a morning star.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

Birmingham Microscopists' and Naturalists' Union: President, W. Hillhouse, M.A., F.L.S.; Hon. Secretaries, Mr. J. Collins, 104 Muntz Street; Mr. S. White, 24 Vincent Street, Balsall Heath. Meets on Monday evenings at 1 Broad Street Corner, at 7.30.

SCIENCE-GOSSIP.

On Wednesday, March 5th, Mr. Edwin Lucas read an interesting paper before the Civil and Mechanical Engineers' Society (Mr. H. Adams in the chair) on a new medium for Fresco Painting, called "Fresco Cement." The composition, invented by Mr. Kremeyer, consists largely of Tufa, together with Portland cement and lime, and the patentee claims for it that, being hydraulic, absorptive, and acid-proof, it is absolutely unaffected by the severest climate. The author gave a highly interesting *résumé* of the history of the art of Fresco painting, and of the various methods employed by great Italian masters; by the modern German School, and by artists in this country, dwelling on the great difficulties with which votaries of the art had to contend; on the elaborate nature of the processes required, and the want of permanence in the completed work. In illustration of the last defect, especially in our climate, he pointed to the fact that English artists had from the twelth century devoted great attention to works of this nature, and asked "Where are those works now?" He then proceeded to quote a favourable report from Mr. H. Farja, M.I.C.E., who moreover tested the strength of specimens which had been immersed in water for thirty-three days. The average tensile strength of five specimens was found to be 312 lbs. per square inch. The paper concluded with a practical demonstration of the extreme simplicity of the process by means of the portable fresco-panels which form a striking feature of the new invention.

Vol. ii. of the "Transactions of the Wagner Free Institute of Science of Philadelphia" contains the following interesting papers: "Report of some Fresh-Water Sponges Collected in Florida," by Edward Potts; "Notice of some Fossil Human Bones;" "Description of Mammalian Remains from a Rock Crevice in Florida;" "Description of Vertebrate Remains from Peace Creek, Florida;" "Notice of some Mammalian Remains from the Salt Mines of Petite Anse-Louisiana;" "On Platygonus, an extinct genus allied to the Peccaries," and "Remarks on the Nature of Organic species," all by Professor Joseph Leidy.

The last number of the "Journal and Proceedings of the Royal Society of New South Wales" contains the following: "Anniversary Address," by Sir Alfred Roberts; "Note on the Composition of Two Sugar Plantation Soils," by W. A. Dixon; "Aborigines of Australia," by W. T. Wyndham; "Note on the Recent Rain-storm," and "Source of the underground water in the Western Districts," by H. C. Russel; "On the High Tides of June 15-17th," by John Tebbutt; "On the Application of Prismatic Lenses for making Normal Sight Magnifying

Spectacles" (illustrated) by P. J. Edmunds; "Flying Machine Memoranda" (illustrated), by Lawrence Hargrave; "Irrigation in its Relation to the Pastoral Industry of New South Wales," by H. G. M'Kinney (with two maps); "Eruptive Rocks of New Zealand" (illustrated), by Professor F. W. Hutton.

Mr. W. A. Gain writes us as follows: "I have just seen a very striking example of the synthesis of light. Going to the post-office, which is in a druggist's shop, I placed on the edge of the usual pigeon-hole, in payment for stamps, what I supposed to be a sovereign; behold, a shilling instead! I took up the coin, wondering whether or not I had paid away the sovereign by mistake and placed a shilling in its place, but no sooner had I taken the piece up than there was the sovereign as ruddy as need be. Among the bottles in the window is one of a blue colour, the light passing through this fell just within the pigeon-hole, scarcely showing on the dark-coloured counter. When the bright coin was laid here this colour mingled with the red and yellow of the gold, producing white reflected light, or rather that very pale shade of gray which silver possesses. The clerk thought it necessary to test the coin which had produced such strange results, thus showing that the phenomonon had not been observed previously."

A very successful photographic exhibition was held at the Crystal Palace from March 11th to 29th, and certainly did great credit to those who had the management of it.

Messrs. R. & J. Beck have brought out a new camera which they call the "Pecrops." The main advantages of this camera are, that whilst being very compact and portable, it is at the same time perfectly rigid, and also possesses great simplicity of adjustment.

H. Georg, of Basle, sends us his catalogue of Botanical works in all languages. There is a wonderfully good variety of books, and the prices asked are moderate.

Mr. S. E. Peal, of Calcutta, sends a copy of his paper, "A Theory of Lunar Surfacing by Glaciation," in which he gives it as his idea that the moon is covered all over, from the poles to the equator, with a cap of ice. The idea is exceedingly well worked out, and the paper is well worth reading.

Nos. 13 and 14 of the "Naturalists' Guide," published by Mr. S. L. Mosley, Beaumont Park Museum, contain a sort of *vade mecum* of butterflies, giving the distinctive features of all British species. This should be very useful, especially to beginners, and the price is most moderate, only sixpence.

The Photographer's Diary and Desk-Book for 1890, published at the office of the "Camera," whose editor has compiled it, is a most useful and valuable book for photographers. The preliminary part gives good hints and formulæ printed in a type that can be easily read by the light in photographic dark room. It also contains a photograph and biographical sketch of Mr. Andrew Pringle, president of the photographic convention of the United Kingdom. The diary is on good paper, and is interleaved with blotting-paper throughout.

Mr. W. K. Mann, of 10 Wellington Terrace, Clifton, sends us a copy of his handy little Catalogue for 1890. In it a natural history student will find mention made of everything useful to him in his studies, and moreover at very moderate prices.

Professor Ville has brought out a new manure for vineyards and vines. It consists of a mixture of phosphate of chalk, carbonate of refined potash, and sulphate of chalk, which, if placed round vine-growths, will enable them to defy the onslaughts of the phylloxera. Nitrate of potash may be used instead of carbonate, which is dear; but, in order to make the manure efficacious in its results, the vines should be fumigated in the late autumn or in January and February. M. Ville has tried his experiments on French vines at Vincennes, but he is of opinion that his manure will be of equal use in America or Australia. He furthermore predicts that his chemical concoction will not only destroy the phylloxera, but lead to an abundance of grapes, which are nowadays so scarce in France that Spanish and Italian vines of inferior quality have to be drawn upon for the fabrication of the French wines.

Rev. J. S. St. John will shortly bring out "Larvæ Collecting and Breeding: a Hand-Book to the Larvæ of the British Macro-Lepidoptera and their Food-Plants." The book promises to be a very useful one, and our entomological readers will show their appreciation of the trouble taken by Mr. St. John to make the book as perfect as possible by becoming subscribers. The subscription price will be one shilling and sixpence, to non-subscribers the price will be two shillings.

At the last meeting of the Cardiganshire County Council Dr. Lloyd Snape, of the University College of Wales, was unanimously appointed county analyst.

Some diligent statistician has got up the following details concerning the recently opened Forth Bridge. Upwards of 21,000 tons of cement, 707,000 cubic feet of granite, and 117,000 cubic yards of masonry were employed in the foundations and piers of the Forth Bridge, and the weight of steel used in the construction of the superstructure was 51,000 tons. The rivets employed in the Forth Bridge would, if laid end to end, cover about 380 miles in length; the number of rivet holes drilled have been over

5,000,000—if put together they would form a tunnel 110 miles in length; while the plates used in the construction of the tubes would extend a distance of 44 miles.

ICHTHYOLOGISTS have been much concerned with the shoals of anchovies that have lately visited the south coast of England. The fish not being known to the fishermen were thrown back into the sea. Mr. Cunningham, naturalist to the Marine Biological Station at Plymouth, states that some anchovies obtained from the pilchard fishermen are undoubtedly of the same species as those imported from France and Italy.

A DISCUSSION has been going on concerning the acclimatisation of the Kangaroo into our already over-stocked and over-preserved country. There is considerable variety of opinion on the subject, as the writers do not say which species is to be acclimatised, whether *Macropus major* (the "Old Man") or the Tree Kangaroo. Anyhow a more useless mammal could not be introduced; nor, in case of the former, a more dangerous one.

THE following are the Lecture Arrangements at the Royal Institution after Easter:—The Hon. George C. Brodrick, Three Lectures on The Place of Oxford University in English History; Mr. Louis Fagan, Three Lectures on the Art of Engraving; Mr. Andrew Lang, Three Lectures on the Natural History of Society; Professor C. V. Boys, Three Lectures on the Heat of the Moon and Stars; Professor Dewar, Six Lectures on Flame and Explosives; Captain Abney, Three Lectures on Colour and its Chemical Action; Dr. Charles Waldstein, Three Lectures on Excavating in Greece; The Rev. S. Baring-Gould, Three Lectures on the Ballad Music of the West of England (with Musical Illustrations). The Friday Evening Meetings will be resumed on April 19th, when a Discourse will be given by Sir Frederick Bramwell, Bart. on Electric Welding; succeeding Discourses will probably be given by Sir John Lubbock, Bart., M.P., Mr. W. H. Pollock, Mr. R. Brudenell Carter, Professor Raphael Meldola, Professor A. C. Haddon, Mr. A. A. Common, Professor Boyd Dawkins, and other gentlemen.

MICROSCOPY.

MICROSCOPICAL SOCIETY OF CALCUTTA.—A general meeting of the members of this Society was held on the 27th January last, when the annual report for last year was read and adopted. The following gentlemen were elected to the Council: Professor J. Wood Mason (Superintendent of Indian Museum, and Lecturer on Comparative Anatomy, Medical College), President; Mr. W. J. Simmons, Vice-president; Mr. W. L. Sclater, Honorary Secretary; Mr. W. H. Ryland, Honorary Treasurer; Messrs. H. H. Anderson, W. H. Miles, J. J. Meade, and W. J. Simpson, M.D. (Health Officer to the Corporation of Calcutta), ordinary members of the Council. The Society has recently been presented by Sir Henry S. Cunningham with one of Messrs. J. Swift & Son's valuable oxyhydrogen microscopes with four objectives, and all the necessary fittings; and we observe that it has been resolved to purchase a good monocular stand to be used with the objectives appertaining to the gas microscope. The President in his annual report gave the Society some useful advice as to how its work could be materially advanced. He referred to four methods which are applicable to similar societies all the world over: field excursions, under the direction of a trained naturalist; the formation and study of collections; practical lessons in microscopy; and the pursuit of special subjects by individual members. In this last connection he directed the attention of the Society to the study of the Indian species of the Thysanura, Collembola, Trichoptera, Physopoda, the smaller Crustacea, the Polyzoa, and the vast variety of Indian spiders. We have seen the report issued for the past year, and consider it excellent.

MOUNTING ALGÆ.—Can any one give me a hint as to the best way of mounting algæ as permanent preparations, so as to prevent the chlorophyll from fading? The ordinary methods very often contract the cells as well as destroy the colour.—*A. G. Tansley.*

THE ROYAL MICROSCOPICAL.—We have received Nos. 73*a* and 74 of the "Journal of the Royal Microscopical Society." No. 73*a* contains the index to last year's journal, and a list of the Fellows. No. 74 contains the usual summary of current researches, and also "Freshwater Algæ and Schizophyceæ of Hampshire and Devonshire," by A. W. Bennett, and "On an Objective with an Aperture of 1·60 N.A. (Monobromide of Naphthaline Immersion) made according to the Formulæ of Professor Abbe in the Optical Factory of Carl Zeiss," by Dr. S. Czapski.

ENOCK'S NEW SLIDES.—We are pleased to get from Mr. Fred. Enock a continuation of the study of bees' legs (similar to those we noticed in the December number of *Dasypoda hirtopes*), showing the admirable differentiation in their structure. With a paraboloid the slides can be examined on both sides. The three slides now before us are the (1) first leg of honey bee (*Apis mellifica*), queen, without pressure, showing the semicircular comb used for cleaning the antennæ; second leg showing spine and flat semi-transparent metatarsus, peculiar to the queen; third leg, showing absence of comb on metatarsus, pincer teeth, hairs, and pollen basket. The second slide shows first leg of worker of the same, showing the semicircular comb; second leg, showing spine to remove pollen from pollen basket on third leg; third leg, showing the pollen basket, wax-pincers, and combs for cleaning. The third slide exhibits first leg of drone of the same, showing the semicircular comb as in first slide; second leg, showing spine to support the body, cleaning apparatus; third leg, showing the absence of all apparatus found on worker to aid in pollen gathering. We hope there is no truth in the rumour that, owing to lack of patronage, Mr. Enock intends to discontinue these charming series of entomological slides. If so, it will be a great loss to students generally.

MICROSCOPIC MATERIALS.—Mr. C. H. Walker, of 12 Church Street, Liverpool, sends us samples of pure glycerine jelly and of his refined Canada balsam. His quality "E" balsam is perfectly pure and colourless, and ought to be very popular. We have also before us specimens of Mr. Walker's slide labels, printed in sheets of 120, gummed. They are sold at the very moderate price of fourpence a sheet.

ZOOLOGY.

NORWICH MOLLUSCA.—As Norfolk has been described as one of the dark corners of England, as far as the knowledge of its mollusca is concerned, I send the following list of species that I have found in the district around Norwich:—*Sphærium corneum*, *S. lacustre*, *Pisidium amnicum*, *P. fontinale*, *P. pusillum*, *Unio pictorum*, *Anodonta cygnea*, *A. anatina*, *Neritina fluviatilis*, *Paludina vivipara*, *P. contecta*, *Bythinia tentaculata*, *B. Leachii*, *Valvata piscinalis*, *V. cristata*, *Planorbis lineatus*, *P. nitidus*, *P. nautileus*, *P. albus*, *P. spirorbis*, *P. vortex*, *P. carinatus*, *P. complanatus*, *P. corneus*, *P. contorsus*, *Physa hypnorum*, *P. fontinalis*, *Limnæa glutinosa*, *L. peregra*, *L. auricularia*, *L. stagnalis*, *L. palustris*, *L. truncatula*, *Ancylus fluviatilis*, *A. lacustris*, *Arion ater*, *A. hortensis*, *Limax flavus*, *L. agrestis*, *L. arborum*, *L. maximus*, *Amalia marginata*, *Succinea putris*, *S. elegans*, *Vitrina pellucida*, *Hyalina cellaria*, *H. alliaria*, *H. nitidula*, *H. radiatula*, *H. nitida*, *H. crystallina*, *H. fulva*, *Helix aculeata*, *H. aspersa*, and var. *exalbida*, *H. nemoralis*, vars. *castanea*, *cornea*, *libellula*, *rubella*, *H. hortensis*, vars. *albina*, *pallida*, *incarnata*, *lutea*, *minor*, *arenicola*, *H. cantiana*, *H. rufescens*, *H. hispida*, *H. concinna*, *H. sericea*, *H. virgata*, *H. caperata*, *H. ericetorum*, *H. rotundata*, *H. pygmæa*, *H. pulchella*, *H. lapicida*, *Bulimus obscurus*, *Pupa umbilicata*, *P. marginata*, *Vertigo pygmæa*, *V. edentula*, *Clausilia rugosa*, *C. laminata*, *Cochlicopa lubrica*, *Carychium minimum*, and *Cyclostoma elegans*. To these may be added the following, which have also been found in this district by other conchologists: *Pisidium roseum*, *Planorbis parvus*, *Testacella haliotidea*, *Hyalina pura*, *Pupa secale*, *Vertigo alpestris*, *Balia perversa*, *Cochlicopa tridens*, *Achatina acicula*, and *Acme lineata*.—*Arthur Mayfield.*

GLASS TUBES FOR CONTAINING SMALL SHELLS, ETC.—As I collect shells which are mostly of small size, I find it necessary to keep the greater part of my collection in glass tubes. I used formerly to employ the ordinary corked kinds so well known to all naturalists, but I found that they possess the following drawbacks: (1) their price, which becomes a rather important item when a large quantity is needed; (2) their liability to break at the sealed end, probably through imperfect annealing; (3) delicate shells unless packed with cotton-wool frequently get broken by rattling about; (4) shells of a comparatively large size are liable to become fixed, when, to dislodge them, it is necessary to break either the tube or the shell. So after a short time I hit upon a method which I think does away with all these disadvantages. I purchase a pound of rather stout, soft, glass-tubing, from one to three-eighths of an inch in diameter (for which I pay the sum of one shilling) and cut it up into two-inch lengths, that size being, I find, the most convenient. The inside of each tube must then be carefully cleaned (for this an ordinary pipe-cleaner answers admirably) and the tube is ready for use. When required for use one end is plugged with a small piece of wadding, and the specimen or specimens inserted at the other end, which must then be likewise closed. I find (1) that these tubes are very cheap, on an average from 150 to 200 going to a pound. (2) Although I have used several thousand of these tubes I do not recollect one breaking, in fact I have often thrown them against a stone wall with all my force without their being damaged. (3) Unless too many specimens are packed in the same tube, the cotton-wool plug protects them from injury. (4) If by any means a specimen gets jammed, it can easily be dislodged in consequence of both ends being open. It is often required to send small specimens in a letter, for this again these tubes come in useful, though I think it safer to enclose each tube in a piece of gutta-percha tubing (which must fit pretty closely round it), as the energetic way some G.P.O. officials stamp letters is calculated to smash anything not made of the strongest material; it is also best to employ somewhat shorter tubes for sending by post as, through their smaller leverage, there is less danger of their being broken.—*S. Pace.*

PRESERVING SLUGS.—I have found Barff's "Boroglyceride" to be a capital medium for the preservation of slugs in tubes. The preparation can be bought from most chemists, or made by heating together sixty-two parts of boracic acid and ninety-two parts of glycerine until the mixture ceases to lose weight. The slugs appear to keep their colour and consistence, and if killed by drowning (this generally takes from one to two days) they die with their tentacles extended and look more natural. Before "tubing" their mucus should be well rubbed off with a cloth dipped in salt and water.—*J. W. Williams.*

Birds of Worcestershire.—To this list I may add the snow bunting (*Emberiza nivalis*), the nest and four eggs of which I obtained about 1872 on the gorse hills near Shrub Hill Railway Station.—*David Wilson Barker.*

Helix Pisana in Oxfordshire.—I have lately taken a single specimen of this somewhat rare mollusc on the railway embankment at Charlbury. I fancy, from the isolated position and locality, that it may possibly have been introduced by some conchologist. If such is the case, I should be glad of further particulars. — *W. E. Collinge, Springfield Place, Leeds.*

Occurrence of the Sand Grouse in Staffordshire.—"Better late than never," must be my excuse for asking you now to record an instance of the occurrence of the sand grouse (*Syrhaptes paradoxus*) in Staffordshire, in September 1888, which is now known to naturalists as the last sand grouse year. Although I made every enquiry, and kept a good look-out in the local newspapers at the time, in order to find out if this bird had occurred in our county, I failed to do so, and it was only on Thursday last, 6th of February, that a farmer residing in the moorland village of Ipstone, about five miles from here, quite by accident, informed me that he had a specimen of the sand grouse in his possession. It is one of two that were shot near Ipstone in September 1888. It appears that a flock of four were seen, one of which was killed and another wounded, the latter being found dead some days later. In the sand grouse year 1863, two were killed out of a flock of about twenty at Eccleshall, in Staffordshire, on the 22nd of May, and are now in the possession of Mr. Samuel Yates of that town.—*John R. B. Masefield, Rosehill, Cheadle, Staffordshire.*

BOTANY.

Botanical Vandalism.—The following letter from Dr. Jordan recently appeared in the *Standard*: I have lately returned from Cornwall, and find even there the destruction of birds and plants is going on with railroad speed. I am not fond of grandmotherly legislation, but if children destroy their toys they ought to be stopped. The ferns are especially attacked. *Adiantum capillus-veneris* seemed to me extinct; the guides at the Lizard told me that *Asplenium lanceolatum*, formerly abundant, was now very rare, and *Asplenium maritimum* is only to be met with in places nearly inaccessible. Handsome flowers like *Inula crithmoides* are also becoming very scarce. The three rare clovers, and the small rushes, as also Herniaria, not being conspicuous, are still to be found. The remedy that I would suggest in the case of extremely rare or local plants is that botanists should subscribe, and either purchase or rent a small plot of ground in or near the original habitat, and that this should be most strictly guarded and preserved. Rare plants and rare insects are most generally found on comparatively worthless grounds —fen, moorland, marsh, or cliff—and this makes the plan more feasible. It would be very easy to draw up a sad list of nearly exterminated species; *Helianthemum olifolium* and *Bupleurum falcatum* might surely be preserved at Torquay, *Trichonema columna* at the Dawlish Warren; but it is not only extremely rare plants which are in danger. *Osmunda* is fast disappearing. *Lathyrus sylvestris* and *Vicia Bithynica*, once so abundant on the Teignmouth cliffs, seem to me now almost extinct. Something might surely be done by a combination of naturalists to avert these destructions, perhaps even to reinstate extinct species. With birds the case is more difficult. King Arthur's own bird is nearly exterminated in Lyonnesse. The eggs of the Cornish chough fetch a high price, and are therefore sought after eagerly. I did not see a single large hawk, harrier, or falcon in Cornwall. Were I a landed proprietor I should take as much pride in my peregrines as in my pheasants. Naturalists might do much to prevent these wholesale destructions if they would act in concert, but it is high time to commence. The mere collector, not the true naturalist, is often an abettor in the mischief.

Cephalanthera Ensifolia and C. Grandiflora.—Some of your readers may recollect a correspondence about these plants which appeared in Science-Gossip for 1887, pp. 91, 117 and 228. Last spring I was in Italy when Ensifolia was in flower, and I saw it in several localities; in fact I never went on the mountain-side without seeing it. One day I gathered 14 specimens which averaged 17 flowers, the numbers were 10, 14, 12, 26, 17, 22, 22, 27, 10, 12, 13, 11, 33. Another day later on I gathered on the well-known Campo dei Fiore, near Varese, 11 more specimens which also averaged 17 flowers. The precise numbers were 12, 18, 25, 22, 16, 19, 14, 14, 13, 24, 10. I did not take any spikes with less than 10 flowers, but I believe those I left were about equal in number to those gathered. All those I got at Varenna were found within a few yards of each other on the slopes just above the Fiume di Latte. I did not meet with any specimens of grandiflora, but on my return to England I had, through the kindness of Mr. Roper (Author of the Eastbourne Flora), an opportunity of inspecting the specimens of both the species which are in his herbarium, with the result that I found his grandifloras (eleven in number) have an average of $9\frac{2}{11}$ flowers, whilst his Ensifolias (7 in number) give an average of $6\frac{2}{7}$, thus fully corroborating C. P.'s belief, at least as regards English specimens of these species. But it will be observed that the Italian plants of Ensifolia above mentioned had an average of nearly three times as many flowers as Mr. Roper's specimens, and nearly double the average on his specimens of grandiflora. Of course the average on the Italian plants would have been reduced if I had gathered all the plants I saw of it, but assuming those not gathered to equal the others in number, and assuming that three of them had two flowers; three, three flowers; three, four; and so on, up to nine flowers, the average of these would be $5\frac{1}{2}$ flowers per specimen; or, taking the whole 48 spikes, there would have been an average of eleven flowers, an average which even then exceeds that of Mr. Roper's grandifloras, and which is almost twice as great as his Ensifolias' give. But I have no doubt that Mr. Roper's specimens of both species are average, and above average, specimens (some of the grandiflora are very fine), and therefore, if an equal number of English specimens below that average were taken into account, his averages would be reduced as mine would be in the way above suggested. I may add that when at Bordighera, in March last, I had the pleasure of inspecting Mr. Bicknell's wonderful illustrations of the Flora of the Riviera between 1800 and 1900 in number, all drawn and coloured by himself in the most masterly manner, and that the specimen of Ensifolia depicted by him—from life—had 29 flowers, whereas grandiflora had but nine. To be candid, however, I ought to add that the notes relating to the illustrations expressly state the specimen of Ensifolia to be a very fine one. The other specimen being, I assume—and Mr. Roper's specimens back up my assumption—an average one. I had the pleasure of gathering some rather rare plants at Varenna, notes on which I will send you on a future occasion, should you care to insert them in SCIENCE-GOSSIP.—*R. B. P., Eastbourne.*

GEOLOGY, &c.

WORKING SITES AND INHABITED LAND SURFACES OF THE PALÆOLITHIC PERIOD IN THE THAMES VALLEY is the title of a most valuable paper by Mr. J. A. Brown, reprinted from the "Transactions of the Middlesex Natural History Society." Not the least valuable part is the excellent illustrations of implements and sections.

THE GEOLOGY OF LYME REGIS.—Being the Report of an Excursion of the Geologists' Association in April, 1889, by H. B. Woodward (Reprinted from Proceedings). Any book or pamphlet with Mr. Woodward's name on the title-page is sure to be well worth reading, and this is no exception to the rule, giving, as it does, a most comprehensive account of the geology of this geologically interesting part.

THE GEOLOGICAL SOCIETY.—At the Annual General Meeting of the Geological Society of London, the usual medals, &c., were distributed as follows:—Wollaston Medal, to Professor W. Crawford Williamson; the Murchison Medal, to Professor E. Hull; the Lyell Medal, to Professor T. Rupert Jones; the balance of the Wollaston Fund to Mr. W. A. E. Ussher; the Balance of the Murchison Fund to Mr. E. Wethered; the balance of the Lyell Fund to Mr. C. Davies Sherborn; and a grant from the Barlow-Jameson Fund to Mr. W. Jerome Harrison. The following officers were then elected: President, A. Geikie, LL.D., F.R.S.; Vice-Presidents, Professor T. G. Bonney, D.Sc., LL.D., F.R.S.; L. Fletcher, Esq., M.A., F.R.S.; W. H. Hudleston, Esq., M.A., F.R.S.; J. W. Hulke, Esq., F.R.S.; Secretaries, H. Hicks, M.D., F.R.S.; J. E. Marr, Esq., M.A.; Foreign Secretary, Sir Warington W. Smyth, M.A., F.R.S.; Treasurer, Professor T. Wiltshire, M.A., F.L.S.

THE EVOLUTION OF THE HORSE.—Professor Flower's lectures on "The Evolution of the Horse," recently delivered to the Royal Institution, were an interesting contribution to the history of the oldest "friend of man." The first discourse was devoted to the genealogy of the beast, with a view to showing that the horse is descended from the Eohippus, if not from a still humbler ancestor, only recently brought to light, under the name of Phenocadus. When Professor Marsh, of Yale, first hinted at this conclusion, some years ago, the world of science was somewhat depressed. The horse had been always so respected and respectable that it was a shock to learn that it sprang from a lowly creature without even the rudiment of a hoof. First we have a cat-like quadruped from the Eocene rocks of Wyoming, in which the fore feet have four complete toes and a rudimentary thumb, while the hind ones have a toe less. Then comes a series of improved forms, in rocks of a later age, in which the toes begin to diminish in number and size, though the owners are not bigger than foxes. As time goes on, and that evolution which seems the law of all things works its way, we find the Miohippus—the "less horse" in short—as large as a sheep, and the Hipparion, in which the foot, though still three-toed, is beginning to hint at the semblance of a hoof—the middle toe alone being of any use, and the two others taking the shape of big splint bones, not long enough to touch the ground. By-and-by, in the Pliocene rocks—geologically of yesterday, chronologically a million or two years old—we light upon the Pliohippus, the "more horse," in which the hoof is formed precisely as that of the modern animal, the lateral toes having almost disappeared; and then, last of all, in the comparatively recent deposits, we come upon the genus Equus, to which the horse, the ass, and the zebra belong. These transitional forms, some thirty or forty in number, are the links which connect the Barb of to-day with the four-toed beast of Eocene times.

NOTES AND QUERIES.

Paludina Vivipara, var. Inflata.—I should be much obliged if you would kindly ask Mr. J. W. Williams to recognise my statement with regard to *Pal. vivipara*, var. *inflata*, Loe., as otherwise his note in the January number appears a direct contradiction.—*C. C. Fryer.*

Seasonable Notes, 1890.—Snowdrops in flower on the 7th; hazel catkins, 23rd; *Ficaria verna* (celandin), 28th; crocus, 30th; *Tussilago farfara* (coltsfoot), pear tree and frogspawn, 31st. This has been a very mild month. Blackbirds and thrushes singing, bats flying about in the evening. These animals come out of their retreats when the temperature is at 50°, or even less. Greenhouse plants that have been left out have not suffered. There is a cytisus in flower in this parish.—*S. Arthur Brenan, Rector of Cushendun.*

Colouring of Eggs.—I have been much interested in the above subject, and may state that in a collection I saw a guillemot egg a pure white, like ivory, perfect shape, and only faint markings all over—not blotches, but very slightly streaked. I have myself in my cabinet two rook's eggs, both from one nest, and the only two, from a rookery near Aberdeen. One is of a dirty white all over, and at the thick end has one distinct black spot about half an inch in diameter, and not a single mark otherwise. It is ordinary size and shape. The other specimen is a very long egg; in fact, you scarcely know the thick end. It is of a deep green, has a ground colour, and faint streaks all over of black. I think this remarkable, as they were both out of one nest, and the only two. On another occasion I saw five eggs taken from a house-sparrow's nest, and one a light green or dirty white colour, with one green blotch on the narrow end. It was a comparatively long egg, but you could easily see the narrow end. I think other egg collectors might be able to give instances which, as Mr. Wheldon says, would prove interesting.—*W. D. Rae.*

Trout Hatching.—The following extracts from the "Season's Notes of the Solway Fishery, 1889–90," will probably be of interest:—"Several sea trout, bred and reared at the fishery, spawned last season; they have never been to the sea. A heron shot at the fishery was found to contain twenty-seven trout. In another was found the skin, head, and greater part of a rat, and a third was found to be gorged with horse beef, amongst which was a trout of about a quarter of a pound. A cat kept at the Solway fishery became quite an adept at catching trout fly. It would sit watching the larger trout for hours, and if it got a chance would make an end of one of them. On two occasions it was seen to make a spring at a leaping trout, both times missing the fish and falling into deep water, when it quietly made for the bank and crawled out. Yearlings turned in last year are now reported $1\frac{1}{4}$ lbs. in weight. The largest trout on record in this country (17 lbs.) was supplied from this fishery, which has also the honour of recording the largest *S. fontinalis* ever taken in fresh water in Britain (9 lbs. 4 ozs.)."—*Thos. Winder, Sheffield.*

Trout Hatching.—The Howietoun Fishery, in the price list for season 1889–90, records two successful exportations of salmon ova for the New Zealand Government, amounting together to a little over half a million eggs, obtained from the Tay, Forth, and Tweed districts. The experiments on artificially land-locking salmon have been successfully continued; but, however interesting from a biological point of view, do not appear likely to lead to any direct results of commercial importance. Indirectly, however, as providing subjects suitable for crossing with Levenensis or Fario, they are of value. The American land-locked salmon (*S. sebago*) has at last been reared from ova obtained at Howietoun, but does not appear to have any advantage over the artificially land-locked salmon, and is markedly more delicate at Howietoun. Depth of water in ponds in which above experiments are being conducted, about ten feet. The rainbow trout have far surpassed the *S. sebago*, but have suffered from an unnamed parasite on the gills. These fish are apparently a migratory form, and their having bred successfully, confined at Howietoun, is noteworthy. The crosses between salmon and trout have now been carried to seven-eighths blood of trout, and one-eighth salmon; both the rate of growth and ratio of weight to length, show a marked increase, while fertility has hitherto been very slightly decreased, more especially in the case of female crosses. Some female crosses have shown an earlier sexual maturity than is usual in either parent.

Increase of Starlings.—Of late years there seems to have been a continued increase in the numbers of starlings in all parts of the country. This can scarcely be accounted for by any decrease in the numbers of their natural enemies. Perhaps it may be owing to a change in their habits of nesting. The majority build under the slates on the roofs of houses, and the young birds can thus be reared in complete safety, which would not be the case in hollow trees and similar situations.—*C. H. Waddell, Whitewell, Belfast.*

Mock Suns and Halos.—On Wednesday, 30th January, at 2 P.M. we observed in the S.W. quarter of the sky three mock suns, three circular halos, and three half-circular halos, one of which was reversed. There was a cross of light, the perpendicular line of which passed through the real sun (which shone faintly), while the horizontal line extended across the inner circle. The brightness lasted for about half an hour, after which the phenomenon began to die away, and it disappeared at the end of an hour and a half. Rays of light were projected from the middle halo.—*John Whitmill, Joseph Whitmill, Ashow Naturalists' Club, Warwickshire.*

Tour to the Orkneys.—I would like to communicate with any gentlemen who have visited the Orkneys during the nesting season, and who are willing to impart any useful information.—*R.*

What's in a Name?—Looking over the back volumes of Science-Gossip, I came upon some curious pronunciation of flowers. Let me add a few more to the list, which may amuse your readers: "Quacking aspen," "Quig in-espy," "*Dielytra* *spectabilis*," "Delightful spectacles," "Cotoneaster," "Cat-in-Easter," "Nasturtium," "Extortion," "Anemone," "Any money," "*Tropeolum speciosum*," Something special from the Tro-picks.—*S. A. B.*

INFLUENZA.—The influenza, which has been so prevalent, is called about here, "Flying Nancy." "Kecks" a local name for "Water Hemlock" and plants of that order. Queen's Co.—*Rev. S. A. Brenan, Cushendun, co. Antrim.*

INSECT PARASITE ON CATTLEYA.—Can any reader inform me, through the medium of SCIENCE-GOSSIP, the scientific name of the insect which affects certain orchids (Cattleyas). I have been told that it is not yet decided upon as to what it is, as it has only of late years been imported with the pseudo-bulbs to this country, but I should think it is known to entomologists.—*Parsons.*

HYPNOTISED WATER.—Will you permit me to state, in reply to a correspondent in Natural History Notes, that water is not always in motion. If your correspondent will take a beaker, fill it with distilled water, turn it upside down till all that can be is poured out, then place it upright on a table for a few minutes, he will then find at the bottom of the vessel a minim rest of water.—*W. A. Ward.*

THE KINGFISHER.—I am glad to see that this bird is getting less scarce in the neighbourhood of Cambridge than it was a year or two ago. At one time these beautiful birds might have been frequently seen about the watercourses near the University town, but such a relentless war was waged against them that they were apparently exterminated. The "Wild Birds' Preservation Act," however, seems to have operated in their favour, and they are once more becoming, at least occasionally, visible.—*Albert H. Wallis.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

W. H. COOKE.—The "Northern Microscopist" is, we believe, no longer in existence. "The Microscope" is an American publication, published at 145 N Greene Street, Trenton, New Jersey, U.S.A. It can also be obtained of W. P. Collins, 157 Great Portland Street, London, W., price 5*s*. per annum.

CONCHOLOGIST.—The bleached white shell is *Purpura lapillus*; the land shell is *Helix virgata*.

C. J. DANKS.—Write to Mr. Jamrach, St. George's-in-the-East, London. He is the greatest dealer in living animals. Montagu Brown's "Manual of Taxidermy" is the best.

H. DURRANT.—Consult a copy of Taylor's "Aquarium: Its Inhabitants, Management, and Structure," for what information you require. You will find a copy at most libraries, or may procure it of Messrs. Allen, Waterloo Place, London.

H. C. T. LANGDON.—Write to Mr. W. P. Collins, 157 Great Portland Street, W., or Mr. W. Wesley, Essex Street, Strand, for a copy of "Lowne on the Blowfly." The last copy we saw was offered for 10*s*. 6*d*.

DR. MACINDOE.—No. 1, fungus parasitic on stem of cock's-foot-grass, is *Epichloe typhina*; No. 2 is a *Clavaria*, possibly *aurea*; No. 3 is *Xylaria hypoxylon*, the so-called "candle-snuff" fungus.

J. H. COOKE (Malta).—Please forward the article, with illustrations.

T. ILLINGWORTH.—We shall be pleased to receive your paper on the Coloration of Birds' Eggs.

C. J. WATKINS.—We have been frequently asked to publish another General Index to the past vols. of SCIENCE-GOSSIP, but as yet nothing has been finally decided upon.

JOHN COOKSON.—We are not acquainted with the "Naturalist's Gazette." Perhaps some correspondent is, and could inform us of the publisher.

EXCHANGES.

I DESIRE fine specimens of macro-lepidoptera. American lepidoptera, birds and eggs, aboriginal antiquities, microscopic slides, and other specimens of natural history offered in exchange.—Levi N. Mengel, Reading, Pa.

WANTED, to exchange a number of micro-slides (pathological), by Cole, for others of general objects.—E. F. B., 15 Jermyn Street, S.W.

WANTED, microscope. Offered, Pratt's "Flowering Plants of Britain," Cassell's "Familiar Wild Flowers" (unbound), 40 parts, a collection of British plants, camera, lens, tripod, and full photographic outfit.—H. Fisher, 26 Stodman Street, Newark, Notts.

WANTED, in exchange for good foreign postage stamps, land and freshwater shells, either British or foreign.—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

A LARGE collection of micro-slides and dried mosses. What offers?—J. H. Lewis, 145 Windsor Street, Liverpool, S.

"GREVILLEA," "Naturalist," and other serials in loose numbers. What offers?—J. H. Lewis, 145 Windsor Street, Liverpool, S.

OFFERED, two good heads of *Hydrionocrinus globularis*. Wanted, a good head and base of *Apiocrinus rotundus*.—J. Smith, Monkredding, Kilwinning, N.B.

WANTED, clutches and nests of the rarer species of British birds, also cuckoos in clutches; good exchange offered.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

A LARGE number of microscopic slides to exchange for other slides, foraminiferous material, papers on the foraminifera, or anything useful. Send lists to—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

MICROSCOPIC slides in exchange for others.—Chas. West, F.R.M.S., 7 Park Row, Blackheath Park, Blackheath, S.E.

COINS, crests, and foreign money notes wanted. Will exchange foreign postage-stamps. Send lists of coins, &c., also quantity of stamps required, to—"Stamp Collector," 24 Sidney Grove, Newcastle.

Bul. Goodallii (from Manchester loc.), and other shells, in exchange for *P. secale* and *ringens*, any vertigos (except pygmæa), *Helix lamellata*, *cartusiana*, *fusca*, and *pygmæa*, or *P. amnicum*.—R. Standen, 40 Palmerston Street, Moss Side, Manchester.

CHOICE microscopic slides, diatoms, parasites, anatomical, double-stained botanical, &c., offered in exchange for foreign stamps, shells, butterflies, or anything interesting.—R. Suter, 5 Highweek Road, Tottenham, London.

WANTED, Syme's "English Botany," bound and perfect, and small powerful astronomical telescope on tripod stand. Will exchange splendid cases of stuffed birds (English), pair of waxwings, long-eared owls, sanderlings, great grey shrikes, widgeon, grub woodpeckers, dotterels, two pair of crossbills, different colours, pair of teal and pochard, single birds, grebe, goosander, mountain linnet, sparrow hawk, goldfinch, &c., oolite and lias fossils, &c.—Gregory O. Renoué, Harrington, Northampton.

WANTED, all naturalists to join the British Practical Naturalists' Society. For particulars, send stamp to the Hon. Sec., Albert H. Waters, B.A., F.S.Sc., Willoughby House, Cambridge.

"NATURAL History of the Nests and Eggs of British Birds," by the Rev. F. O. Morris, 233 coloured plates, 3 vols. super royal 8vo. Exchange Sowerby's "British Grasses," or what offers?—E. S. Salmon, Clevelands, Wray Park, Reigate.

WANTED, collections of rare foreign stamps, in exchange for natural history specimens.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WHAT offers for three beautiful injected preparations—urinary bladder of frog, skin of toad, and intestine showing injected villi?—Ferdinand Tomlins, High Street, Gosport.

WANTED, a text-book of British fungi. Offered, Geikie's "Field Geology," Wright's "Experimental Optics, White's "Selborne," lantern slides, &c.—G. Barker, 24 Avenue Villas, Cricklewood, N.W.

THE last four volumes of "Nature," in weekly numbers, in exchange for any good scientific books, or side-blown birds' eggs.—Thomas Illingworth, 4 Alliance Street, Harpurhey, Manchester.

WANTED, healthy pupæ of *Smerinthus populi*, in exchange for *S. ocellatus*. Write first to—W., 60 Lillieshall Road, Clapham Common, London, S.W.

SCIENCE-GOSSIP wanted, bound or unbound, for 1866, 1867, 1869, 1871, 1872.—G. E. Mainland, Glenthorpe, Woodside Lane, North Finchley, N.

OFFERED, *Unio margaritifer*. Wanted, any of the following: *Unio tumidus, P. nitidum, P. roseum, B. Leachii, A. lacustris, H. lamellata, B. montanus, P. ringens, A. acicula*, or varieties of *Helix aspersa, nemoralis, hortensis, arbustorum, virgata, caperata*, not in collection.—James Simpson, 51 Loch Street, Aberdeen, N.B.

WHAT offers for a microscope lamp with porcelain shade, in case?—Rev. C. H. Waddell, Whitewell, Belfast.

DUPLICATES.—*A. cygnea. S. corneum*, var. *pisidoides, H. nemoralis*, var. *libellula, H. hortensis*, var. minor, *H. ericetorum, F. antiquus, M. incurva, pellucida, T. testudinalis*, all from vicinity of Edinburgh, also *E. sphæra*, without spines, and a few zoophytes and marine algæ, unnamed. Desiderata, lepidoptera and shells not in collection.—W. Turnbull, 1 Horne Terrace, Edinburgh.

WANTED, well-marked forms of *Helix nemoralis* and *hortensis* from different localities. British land and freshwater shells given in exchange.—C. H. Morris, Lewes, Sussex.

Helix aspersa, nemoralis, cantiana, virgata, rufescens, rotundatus, Clausilia rugosa, Limnæa peregra, &c., in exchange for *Conus marmoreus*, &c.—Chas. Pannell, jun., East Street, Haslemere

WANTED, slides on which have been mounted all or any of the following fossil foramens:—*Nosodaria glabra, N. hispida, N. pyrula, N. raphanistrum, N. orvicula, Dentalina elegans, D. communis, D. filiformis; Orbitoides Mantelli, Rotalia orbicularis, R. corallinarum, Amphistegina vulgaris.* Any miocene foraminifera will be acceptable. Exchange recent foramens and miocene fossils. State wants.—I. H. Cooke, B.Sc., Ashfield House, Malta.

WANTED, *Cidaris spinosa, C. sceptrifera*, and *C. scillæ*, also small specimen quantities of the marl beds of Jamaica and Trinidad.—I. H. Cooke, B.Sc., Ashfield House, Malta.

OFFERED, box containing sixty-six varieties of British marine shells. Wanted, Davies' "The Preparation and Mounting of Microscopic Objects," Taylor's "Collecting and Preserving Natural History Objects," or other useful books.—Ada L. Betton, 20 Caledonia Place, Clifton, Bristol.

NINETEEN numbers of "Nature," June to October, 1889, for exchange. Wanted, good microscopic lamp or mounted foramens.—I. H. C., Ashfield House, Sliema, Malta.

WANTED, a good binocular microscope with 1-inch, ¼-inch, and ⅛-inch objectives. Must be by a maker of repute. Send particulars to—I. H. C., Ashfield House, Sliema, Malta.

FOR disposal, polished geological cabinet specimens of Devonian (madrepore) corals and sponges. Offers requested.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTED, the following shells: *Limnæa involuta, Isocardia cor, Clio pyramidata*, and *Mangelia striolata*. State desiderata required in return to—Alfred Sclat r, Bank Street, Teignmouth, Devon.

SEND interesting object for parasite of *Geotrupes stercorarius*, ready for mounting. Also wanted, other parasites, unmounted, for stamps.—H. Durrant, 4 Boulton Road, West Bromwich.

BEGINNER would be glad of a few duplicates of land, freshwater, and marine shells; also beetles, however common. Postage returned with box.—Alstead, North Street, Jarrow.

OFFERED, British and foreign shells in exchange for others not in collection, or for pieces of old china. Also to exchange foreign stamps with other collectors.—Mrs. Heitland, The Priory, Shrewsbury.

ECHINODERMS from chalk, and fossils from Thanet sands, in exchange for echinoderms from other formations, also native weapons or curiosities.—Fredk. Stanley, 6 Clifton Gardens, Margate.

WANTED, foreign shells, recent or fossil, in exchange for British land, freshwater, or marine shells.—Fredk. Stanley, M.C.S., 6 Clifton Gardens, Margate.

DUPLICATES.—*L. glutinosa, S. corneum, N. fluviatilis, B. tentaculata, B. Leachii, P. nautileus, P. fontinalis, P. hypnorum, S. putris, S. elegans, P. contortus, P. corneus, H. ericetorum, H. cantiana, H. rotundata*, and *H. ventrosa*. Desiderata, shells or other natural history specimens.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

OFFERED, Cassell's "Electricity in the Service of Man," in clean, unbound parts. Wanted, some young live squirrels (*Sciurus vulgaris*).—Chas. Leigh, Nat. Hist. Mus., Cromwell Road, London, S.W.

WANTED, *Pisidium roseum*, also foreign clausilias. Offered, fine specimens of *Helix lamellata* and *Zonites excavatus*.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

Productus punctatus, Posidomya, Rhynconella, Anthrocosia robusta, Lingulella equamiformis (rare), *Goniatite crenistra*, all from the carboniferous, given in exchange for a good agate, or one or two good quartz crystals. Also "Table of British Strata," showing superposition and relative thickness, by H. W. Bristow, F.R.S. (coloured), sent in exchange for crystals of minerals, or fossils from greensand, old or new red sandstone.—P. J. Roberts, 4 Shepherd Street, Bacup.

WANTED, birds' skins, lepidoptera, fossils, and some other objects of natural history, also books. Address the Secretary of the Practical Naturalists' Society, 61 Mill Road, Cambridge.

WILL one or two gentlemen join the writer in a geological trip to the Isle of Wight at Whitsuntide, from Saturday to Tuesday? Particulars—G. E. East, jun., 10 Basinghall Street, London, E.C.

WANTED, latest editions Grey's "Anatomy," Carpenter's "Micro Manual," and the "Micrographic Dictionary." Will give good exchange.—H. E. E., 344 Caledonian Road, London.

COLLECTION of 400 stamps in exchange for natural history books.—E. Platt, New Street, Chipping Norton, Oxon.

WANTED, stems of *Hippuris vulgaris* (the mare's tail), maize, *Lycopodium clavatum*; leaves of camellia, urtica, ruta, psoralea, maize, and *Prunus lauro-cerasus* (the cherry laurel); flower-buds of *Helleborus fœtidus*; root of *Hyacinthus orientalis*; the freshwater algæ, *Ulothrix zonata* and *Vaucheria sessilis*, spirogyra (especially if in conjugation); leaves of the barberry infected with *Berberis vulgaris*, and leaves of colts-foot infected with æcidium; the lichens *Parmelia parietina, Solorina saccata, Lecanora subfusca*, and *Physcia stellaris*, all in fruit, *Claviceps purpurea*, or "ergot of rye," and peziza. Liberal exchange in first-class micro-slides, &c. — Charles Rogers, 45 Harper Street, Brooks' Bar, Manchester.

CORRESPONDENTS desired in Ceylon, Hong Kong, or Jamaica, who will exchange shells for beautifully cut and polished imitations of precious stones, British shells, or useful articles.—W. Jones, jun., 27 Mayton Street, Holloway, London.

PHOTOGRAPHY.—¼-plate Le Meritoire set—camera, lens, tripod, and two dark slides; also ¼-plate Instantograph set, with six dark slides, "Underwood" lens, and pneumatic shutter, tripod, in case complete. What offers in books or microscopic apparatus?—J. W. Horton, Brayford Wharf, Lincoln.

OFFERED, fifty microscope slides, and illustrating essay by Dr. Frey, on the "Lower Class of Animals," with hand microtome. Wanted, good ⅛ objective.—J. Rutterford, Jardington, Dumfries.

OFFERED, *Mactra solida, M. stultorum, M. subtruncata, Cypræa Europæa, Donax anatinus, Natica catena, Cardium aculeatum, Solen legumen, S. ensis, Tellina tenuis, Turritella communis, H. rupestris, Pupa umbilicata*, &c.—Wanted, *H. lapicida*, and other land and freshwater shells.—A. Whitworth, 65 Talbot Street, Southport, Lancs.

BOOKS, ETC., RECEIVED.

"Naturalist's Voyage," by Chas. Darwin (London: John Murray).—"Arenaria gothica" (Fries) as a Plant new to Britain," by Chas. Bailey.—"Geology of the Quicksilver Deposits of the Pacific Slope," by G. F. Becker (with atlas) (U.S. Geological Survey, vol. xiii.).—"Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley," by J. S. Newberry (U.S. Geological Survey).—"United States Geological Survey Bulletins" (Nos. 48 to 53).—"Meteorology of Australia, &c."—"Transactions of the Wagner Free Institute of Science of Philadelphia."—"Murray's Handbook of England and Wales" (London: John Murray).—"The Reign of Law," by the Duke of Argyll (19th edition) (London: John Murray).—"British Fossils," by J. W. Williams (London: Swan Sonnenschein).—"Journal of the Royal Microscopical Society."—"Canadian Entomologist." — "Naturalists' Guide." — "The Observer." — "A 1." — "Nature Notes."—"The Woman's World-"—"The Naturalist."—"The Field Club."—"The Antiquary."—"Springtide."—"Handbook of Scientific and Literary Bible Difficulties."—"Journal of the Proceedings of the Royal Society of New South Wales."—"Catalogue of the Scientific Books in the Library of the Royal Society of New South Wales" (Part i.).—"Cassell's Technical Educator."—"Revue Scientifique."—"The Optical Magic Lantern Journal."—"Research."—"The Amateur Photographer."—"The Botanical Gazette."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope," &c., &c.

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

PRO GLORIA DEI: PRO UTILITATE HOMINUM.

By Dr. ALFRED J. H. CRESPI.

Examiner, Hon. Life Member and Lecturer, St. John Ambulance Association.

[*Continued from p.* 55.]

THE description of the body over, whether confined to one or extended to three or four lectures, the instructor touches upon the theory of the circulation, the mechanism of the heart, and the course of the great arteries and veins; shows where important blood-vessels are commonly injured, and dwells at length and makes clear, with the aid of diagrams, the points to which particular attention should be directed. He compels his listeners to understand that the circulation takes place in an intricate system of closed elastic tubes, called arteries and veins, and informs them that whenever hemorrhage occurs, and in whatever part of the body, it ought at once to be controlled, and such control can be effected by pressure skilfully and properly applied. Never mind how terrible the gush of blood, never mind how trifling the flow, it should be controlled, and it must never be forgotten that the sufferer can nearly always restrain hemorrhage from his own body. Now comes what may be called the peculiar beauty of the instruction. Had the lecturer to teach the application of complicated surgical contrivances, its practical value would be small, those appliances would not be forthcoming in the hour of need, nor, when they could be got, would any, save dexterous surgeons, be able to apply them properly; but pressure is the only thing needful, and to apply it a circlet of rag, or linen, or indiarubber, a ring, in short, of any suitable and soft portion of the clothing is all that is needed—a pad can be made with a stone wrapped in a handkerchief; then, when the pad is laid on the artery, and the circlet is put round the limb and loosely tied, the introduction of a short stick or an open penknife is sufficient, and the latter should be twisted round and round until the hemorrhage ceases. One-fourth of the deaths on the battle-field are, it is said, due to uncontrolled hemorrhage; and, although this estimate may not be strictly accurate, many lives are undoubtedly annually sacrificed by loss of blood, while in many instances, in which death does not occur, recovery is retarded by hemorrhage, which a simple contrivance would control. Some ingenuity is needed in applying an extemporised tourniquet, and in acquiring the necessary dexterity the pupil has no cause to complain that he is wasting his time.

The next stage is the first treatment of those commonest of accidents, broken bones. The strength of bone is an inexhaustible topic, and greatly astonishes students; but even the thigh bone, the largest and heaviest in the body, can be broken, and the points where fractures occur are shown, and the importance of delicate handling insisted upon. Then comes the practical part, the adaptation of local supports; here too there is great scope for ingenuity on the part of pupils and ability on that of teacher. No complicated and costly iron, steel, ivory or whalebone splints are called for; the guiding principle to be insisted upon is to handle the limb delicately, to surround it with some kind of soft padding, such as wool, linen, grass, or hay, and to put over this padding some simple supports, such as a few stout newspapers, a piece of brown paper, a great-coat, or a book cover, and finally, to keep padding and extemporised splints firmly in place by means of bandages. No bone can be broken in any part of its course, nor can an accident occur anywhere—in the open country, in the crowded factory, or in the coal mine—which does not admit of efficient first treatment.

The fourth stage is more technical, and so less interesting ; it consists in instruction regarding a large number of miscellaneous matters, such as the treatment of the poisoned, of the intoxicated, and of the apparently drowned ; of burns and scalds, and fits, and the bites of infuriated animals, and of the quickest way to extinguish flames, and what to do with lime in the eye or vegetable matters in the ear.

The last stage resolves itself into two portions, the elements of nursing in the case of female, and the removal of the injured in that of male classes. Here also the instructor deals with simple appliances. He cautions his listeners against haste ; urges them always to be calm, thoughtful and self-reliant, but not slow, shows them how to make stretchers of blankets, great-coats, and sheets, and how to attach to them poles of the rudest and roughest character, so that an injured person can be safely treated either in the house or in the field until the arrival of the medical attendant.

A recapitulatory lecture should never be omitted, and some practice should be given in answering papers, and then the pupils should submit to an examination conducted by an examiner deputed by the Parent Association, and in due time the successful candidates receive a certificate, the form and style of which are handsome and artistic.

The advantages of ambulance work are not exhausted. The lecturers themselves learn a great deal, and are taught to discard in their own practice cumbrous and expensive surgical appliances, and to use the simplest things and to utilise those common appliances, which, while always at hand, are often more comfortable and satisfactory than the complicated and costly contrivances on which the fancy of surgical instrument makers runs riot.

The St. John Ambulance Association has its head quarters in the ancient and picturesque gateway of the famous and once magnificent priory of Clerkenwell, formerly the chief house in England of the order of St. John of Jerusalem, in those far distant days when the Prior was Premier Baron of the realm. The courteous and able Chief Secretary, Sir Herbert Perrott, is assisted by a large and efficient staff, who contrive to get through a vast amount of work, and to do much good at little money cost. The medical profession, on the whole, has nobly seconded the efforts of the Association, thus acting in the spirit of Emin Pasha, who has beautifully said, "May I give you a word of warning ? Keep yourself well in hand, and do not follow without very just cause the too modern development of medicine. A sick man is no subject, but a feeling and suffering being, whose sensibility is greatly heightened. Be to your patients, in the first place, friend, then doctor. Our mission is a high and holy one, and the murmured thanks of a poor man are of far higher value than a few guineas, and the knowledge that one has saved a sick child for its mother is a far more beautiful reward than can ever follow a brilliant but risky operation, or the humbug of the so-called scientific medicine. Do not laugh at my words. I have grown old and grey in the battle of life, but it is just this idealism which has helped me over many a bitter hour. My strife and work draw near to their close." The crowning privilege of the doctor is to think more of others than of himself, to sacrifice himself, to wear himself out in carrying assistance to many who hardly trouble to thank him, hardly seem to realise that they have received anything of value at his hands. And when his Christmas bills pour in upon him and find him, as they do me, with an empty exchequer, he often has to ask : Is not the labourer worthy of his hire? Few ambulance pupils show the smallest gratitude for the loving instruction which they receive, often, nay nearly always gratuitously, from busy and preoccupied teachers—instruction which, remembered and acted upon, does not avert accidents, but infallibly makes their effects less awful, and in many cases prevents an injury being aggravated, so that recovery is completed in a few weeks instead of extending over months, and as far as that economy of time and diminution of suffering are effected very seriously curtailing the receipts of the medical attendant. But what indescribable satisfaction there is in saving life, in giving assistance promptly and effectively just at the right time, in stemming the life current, in restoring brightness to the eye, and preserving vigour of limb ! Those only can enter into this joy who have been privileged to render such help.

After all, only the fringe of the subject has been touched ; millions of people have not had the benefit of such training, while everyone should have it. Every great public school should arrange for a course of ambulance lectures, more particularly in these days when athletic sports are part of the school training, and the masters are expected to be proficient in them and to devote time to them. Policemen, soldiers, railway porters and ministers of religion, to say nothing of schoolmistresses, nurses, and employers of labour, should know what to do while the doctor is coming. Wisely has the St. John Ambulance Association adopted the motto of the old Catholic order, for never surely was work more conspicuously undertaken—

Pro gloria Dei: pro utilitate hominum.

Wimborne.

WEEDS.

A WEED may perhaps be defined as an uncultivated plant growing on cultivated ground. A more restricted definition, as "a plant injurious to Agriculture," would hardly apply to all weeds, or even more than a section of them, unless very slight and almost theoretical injuries were taken into account. For I suppose any wild plant growing where cultivated plants are growing, or to be grown, must be regarded as injurious to a certain extent, because it takes nutriment from the soil; but, if we had to define exactly the extent of this injury, I think we should often find it was hardly "visible to the naked eye." There is another class of plants often called weeds, which do not fall under either of the definitions given above, namely, "poison-weeds," which grow wild among wild plants, and are injurious to man or beast. A case in point is the well-known "loco-weed" (*Oxtropis Lamberti*) of the Rocky Mountain region, which has such dire effect on horses and other animals. I do not think, however, that poisonous plants of this kind have any real right to be classified with weeds proper, and I shall omit them from the present slight review.

It has seemed to me that weeds might probably be classified under two main heads:—

1. Weeds which are not confined in any way to cultivated land, and which do not disappear on land that is highly cultivated, unless actually grubbed up and removed. These weeds are aggressive, and highly injurious to agriculture; they usually belong to large genera in large natural orders, and are variable.

2. Weeds which are mainly confined to waste or cultivated ground, and which tend to disappear on high cultivation, and do not commonly grow amongst a heavy crop. These weeds are such as fail in competition with other plants, and are not notably injurious to agriculture. They probably often represent types nearing extinction, and commonly belong to small genera or small natural orders, or both.

Professor B. D. Halsted has suggested (*in litt.*) the terms aggressive and provisional to be applied to these two classes. It is a singular thing to reflect that, if all cultivated and waste ground were suddenly covered with a coating of verdure, a large class of plants would almost certainly become extinct from sheer inability to cope with other plants in the struggle for existence. Every one knows that when previously verdant ground is broken up, and the earth, often from quite a distance beneath the surface, is exposed and bare, a crop of plants will often spring up which did not exist before on the spot, and which will die out again (leaving, no doubt, their dormant seeds) when or if the grass and other sod-forming plants assert themselves.

Red poppies appearing on a continental battlefield afford an historical instance of this. By almost any roadside in England, the same thing is illustrated by the little *Urtica urens*, asking only for leave to live on some vacant spot. In Colorado, we have *Cleöme integrifolia* growing by roadsides, where hardly anything else will grow, really usurping no man's land. From its pods, it is often called "beanweed."

How different is the conduct of the thistles, which belong to the "aggressive" division. It is no longer "by your leave;" with your leave or without it they mean to grow where it suits them best, and if there is a crop of something else so much the worse for the crop. To look at a list of the North American fauna, one might think the room for thistles was already occupied. The *Cnicus arvensis* of Europe thought differently, and, being introduced, has contrived to render itself unpleasantly conspicuous under the name of "Canada thistle." Another composite plant, which can hold its own in a rich English meadow, has got imported into America; this is the ox-eye daisy (*Chrysanthemum leucanthemum*), a pretty flower, but none the less a weed, and an aggressive one. It has even spread far westward, and is listed among the twenty worst weeds of Kansas.* *Arctium lappa* figures along with it, in the same list.

It is luck for the English farmer that the climate is not quite suited in the matter of warmth and dryness for the common sunflower. *Helianthus annuus* and some allied species are terrible weeds in western America. I have seen grain-crops so interspersed with sunflowers as to often give rise to the sarcastic remark, "So-and-so has quite a little grain among his sunflowers." This was in Custer and Fremont Counties, Colorado. Surely nothing but the climate has prevented *Helianthus* from running wild extensively in England; so there is some advantage, after all, in what are not generally considered the beauties of our English climate.

Another imported weed of some note in America is *Chenopodium album*. We have it in profusion round houses in Colorado high up in the mountains; but it is not purely a nuisance, for, if your garden crop fails, you are pretty sure to have a good crop of "lamb's-quarter" in its place, which may be cooked as spinach, and if picked at the proper time is equal or superior to that vegetable.

The purslane (*Portulaca oleracea*) is another noted weed in America; it figures in the twenty worst weeds of Kansas, and (as Professor Halsted informs me) also in the twenty worst weeds of Connecticut, showing thus abundance at each end of an extensive range. Professor Halsted points out to me that *P. oleracea* is an exception to my classification of weeds, being a great weed, and yet of a comparatively small genus and natural order; and, indeed, there are plenty of exceptions of this kind, if searched for. Now it may be that *P. oleracea* is classed thus highly as a weed rather for its abundance than its aggressiveness, and, after all, it is said to be good for feeding pigs; but it is rather more likely that it forms a genuine exception, typical of a class of exceptions.

Most weeds, as is well known, though existing under circumstances of cultivation for ages, remain

* Kellerman and Swingle, "First Annual Report, Kansas Experiment Station," for 1888, p. 344.

essentially "wild." That is, they are not modified like cultivated plants, nor so dependent on man's exertions; but may there not be exceptions? Suppose a third class of weeds, which, accompanying cultivation, have themselves been in some sense cultivated; may not this explain some anomalies? And, in regard to this *Portulaca oleracea*, we find three varieties advertised for sale in France.*

It is astonishing how readily weeds become acclimatised to new conditions. It might reasonably be argued that, of the plants introduced into a country by commerce, the majority would naturally be weeds. Quite so, but this does not perhaps fully explain the great adaptability and spread of weeds. Weeds, in fact, are like freshwater productions living in isolated water-system.† Their very existence as successful weeds depends on their power of acclimatisation; hence great variability and little fixity of variations. Cultivated plants would be just the same but for the effects of artificial selection.

In a new country, before any cultivation has taken place, it is not always easy to say which of the wild plants will prove aggressive weeds. A cultivated patch of land called Smith's Park, somewhere over nine thousand feet above sea level in the mountains of Custer Co., Colorado, is instructive in this respect. *Chenopodium album* puts in an appearance there in great force, as if that was its own native home; but of the native plants we see *Troximon glaucum* representing the dandelion, and *Echinospermum floribundum* and *E. Redowskii* representing themselves, to a deplorable extent. These Echinospermums have prickly fruits which get on one's trousers and on to horses' manes and forelocks, and are thus productive of considerable bad language—and this not from the horses, who suffer most. *E. floribundum* has pretty pale-blue forget-me-not-like flowers, and its fruit takes particular care that you don't forget it, being the worse of the two.

Sometimes weeds get carried above their natural altitude by accident. Near the Micawber Mine, about 10,000 feet above sea level in Western Custer Co., Colorado, I noticed this. *Cleöme integrifolia* had come up from some dropped seed, but it certainly would not propagate itself so high in the mountains, and *Helianthus petiolaris*, even more out of place, doubtless owed its advent to seeds in some hay from Pueblo County, about sixty miles away and thousands of feet lower down.

The study of weeds from the economic standpoint is of more interest than might at first appear, not to speak of its practical value. May I here commend the matter to the increased attention of botanists?

T. D. A. COCKERELL.

West Cliff, Custer Co., Colorado.

* Vilmorin-Andrieux & Cie., "Cat. Général de Graines," &c., 1889, p. 64.

† SCIENCE-GOSSIP, August 1888, p. 183.

A DARK-FIELD STOP.

By WILLIAM LIGHTON.

DARK-FIELD illumination, when using lenses of high power, and especially homogeneous immersion lenses, has been long desired and is at last accomplished.

After arranging the mirror so as to obtain central light and removing the eye-piece, on looking down the tube the mirror appears a bright figure in the centre of the back lens of the objective (see Fig. 53, B). Let the large circles (Figs. 53 to 58) represent the back lens of an oil immersion or dry objective of large aperture. On swinging the mirror from right to left its image in the lens will pass from left to right, as

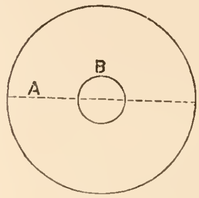


Fig. 53.

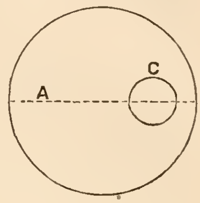


Fig. 54.

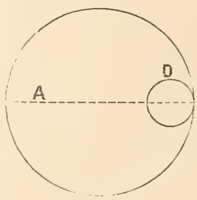


Fig. 55.

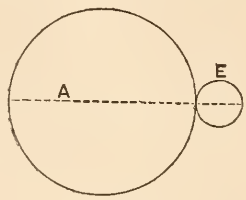


Fig. 56.

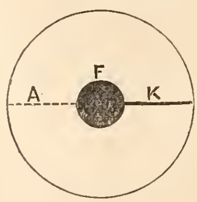


Fig. 57.

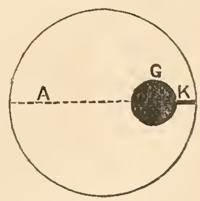


Fig. 58.

indicated in figures 55 and 56. Light from the mirror in this position is known as oblique light. If, when using a dry objective, the mirror is swung so far to the left that its image cannot be taken up by the objective, dark-field illumination is obtained (see Fig. 57, E).

When homogeneous-immersion objectives of large numerical aperture are used, dark-field illumination by the mirror alone is impossible, because such lenses receive light from all points beneath the stage.

The following method produces a dark-field with the mirror in any position from central to extremely oblique:

A metal frame is used as a carrier for the dark-field stop H (Fig. 59), which is also of metal, and which is joined to the carrier by a fine steel wire, K. The carrier slides in a square nose-piece, L (Fig. 59), between the objective and the body tube of the microscope, as shown at the double-dotted line N (Fig. 59). The nose-piece should have a revolving fitting, as shown in the sectional view. The handle of sliding carrier is at I (Fig. 59). The stop H (Fig. 59) must be of the *same* size as the image of the mirror in the objective used, and is for the purpose of

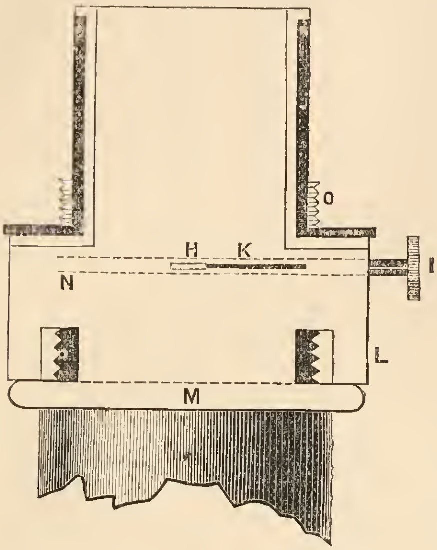


Fig. 59.

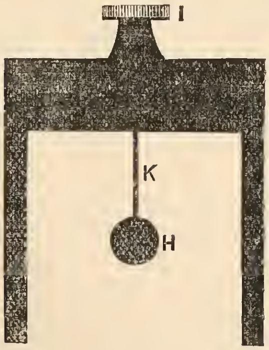


Fig. 60.

intercepting this image in the objective. M is the objective, and O is the standard screw for body-tube (Fig. 59).

It will easily be seen that by moving the stop the image of the mirror can be intercepted at any point from the centre to the extreme edge of the objective. The best effects are obtained when the stop is placed a little beyond the centre, as at C (Fig. 54).

The motions indicated can all be reversed by means of the revolving fitting of the nose-piece. Changes from dark field to bright, and the reverse, can be instantly made by sliding the carrier in its fittings.

The effects obtained by the use of this piece of apparatus with homogeneous-immersion lenses are very remarkable. The internal organs of infusoria are shown with a precision and beauty never equalled. Bacteria in fluids are seen as brilliant points of light. Vast numbers that are above and below the focus, and which could not be seen in a bright field, and brought into view. The trachea of *mosquito larvæ* can easily be traced as beautiful thread-like lines throughout their entire length.

In examining stained human muscle containing trichina, and using a one-fifths dry objective with bright field, great care is required to see the parasite in its cyst, but, on a dark field produced by the use of the stop, the worm will be seen as a brilliant coil, and can be plainly traced from tip to tip.—*American Monthly Microscopical Journal.*

THE BEST HUNDRED BOOKS IN NATURAL HISTORY.

By H. Roberts.

The list given under the above heading, in the February number of Science-Gossip, has elicited various suggestions and proposed alterations from readers of this journal. For the most part these are not of very great value; but some hints which I have received have been most useful, and my very best thanks are due to all those who have so kindly tendered advice whether I have followed it or not.

The following is a list of useful alterations:—

The "Classical" and "General Natural History" lists require no alteration. The same is the case with the "Handbooks" "Works on Prehistoric Times," "Atlases," and "Biographies." In the "Works on Function" Lubbock's "British Wild Flowers" and "Flowers, Fruits, and Leaves," may be omitted.

The following list of "Text Books" may replace the previous one with advantage :—

Text Books.

Huxley and Martin's "Practical Biology," or Marshall and Hurst's "Practical Zoology;" Claus and Sedgwick's "Zoology;" Gray's "Human Anatomy;" Flower's "Comparative Osteology;" Huxley's or Foster's "Physiology;" Foster and Balfour's or Balfour's "Embryology;" Tylor's "Anthropology;" Lyell's "Elements of Geology;" or Geikie's "Text Book of Geology;" Oliver's "Elementary Botany," or Prantl and Vine's "Text Book of Botany;" Goebel's "Morphology of Plants:" Sach's or Vine's "Physiology of Plants;" Bower's "Practical Botany."

NOTES ON NEW BOOKS.

Astronomy with an Opera-Glass, by Garrett P. Serviss (New York: D. Appleton and Co.). This is the second edition of a highly successful work. It is one of the best works on "Astronomy for the Million" we have seen; and young students, of that noble science who sigh for telescopes, can here learn how much they may see with an ordinary opera-glass. The book is divided into "Stars of Spring," "Stars of Summer," "Stars of Autumn," and "Stars of Winter," and there is a fifth chapter on the "Moon, Planets, and Sun."

Elements of Astronomy, by Dr. Chas. A. Young (Boston: Ginn and Co.). It will be sufficient to state that this is a text book intended for use in high schools and academies, and that Dr. Young is the author of the admirable work on the sun published in the International Scientific Series. Professor Young had previously written a treatise on General Astronomy, but the present volume is an entirely new work. Its scope is as large as the science with which it deals; and, as the author's style is noted for its perspicacity, those of our readers who desire a work on astronomy will understand this is the very one they should get. It is abundantly illustrated, has a capital index, and appendix of important astronomical odds and ends. There is also included an Uranography, or brief description of the constellations visible in the Northern Hemisphere. This is illustrated by star maps.

A Handbook of Quantitative Analysis, by John Mills (London: Chapman and Hall). Students of chemistry cannot complain of want of attention. Indeed, of the writing of books on the subject there seems to be no end. The present neatly got-up volume has been written with a view to assist students who may be going in for the Honours Examination in Inorganic and Organic Chemistry at South Kensington Science and Art Department as well as for the B.Sc. and M.B. examinations. It seems admirably adapted for this purpose, as well as for the larger one of being a handy book of reference for all people who are interested in chemical operations.

Alternative Elementary Physics, by John Mills (London: Chapman and Hall). This is another handy little volume, written expressly for the course required by the Department of Science and Art, in the Science Directory. It deals with Sound, Light, Heat, Magnetism, Frictional Electricity and Voltaic Electricity, and each chapter is illustrated by a series of easy experiments, which bring home to the student the principles he has been learning. We cordially recommend this book to all whom it concerns.

Electric Light Installations and the Management of Accumulators, by Sir David Salomons (London: Whittaker and Co.). This is a practical handbook, intended for working electricians, and a better one could not be put in the hands of those who are taking up this profession. The work has already made its mark, having gone through four editions; but electrical engineering has progressed by such leaps and bounds that a very few years make an earlier work ancient history. Sir David Salomons therefore has taken advantage of a fifth edition being required to thoroughly revise and greatly enlarge the scope of his treatise. He has added two new chapters to it and several important new plates.

Electrical Influence Machines, by John Gray (London: Whittaker & Co.). We have here a very instructive little book both for students and those general readers who are interested in the history and progress of electrical science. It deals with the phenomena and leading principles of static electricity, and has half a dozen highly interesting and well-illustrated chapters describing influence machines, besides two other chapters devoted to their practical construction. The chief and most valuable feature in the work is the copious and numerous descriptions of all sorts of electrical machines which have been invented from the earliest times till now.

Idylls of the Field, by F. A. Knight (London: Elliot Stock). Our readers will remember the pleasant notice of "Leafy Ways" by the same author, which we had the pleasure of giving in Science-Gossip a few months ago. The present handsomely got up and beautifully illustrated little volume is a sequel to the former work, containing delightful sketches of nature in her varying moods such as frequently remind us of Richard Jeffrys.

Glimpses of Animal Life, by William Jones (London: Elliot Stock). This is another volume of popular natural history essays and sketches, highly readable and pleasant, and frequently instructive. Mr. Jones has that large sympathy with animals which is the first requirement for a man who undertakes to write on these subjects.

English Idylls, by P. H. Emerson (London: Sampson Low). This is the second edition of a cheap and charming little book of nature pictures drawn from life. It is full of vigour and character, and is altogether a delightfully original work.

Hampstead Hill, by J. Logan Lobley (London: Roper and Drowley). Mr. Lobley has been joined by a few kindred spirits in the production of a very handsome monograph. It demonstrates that London has within her borders an area where the geologist, ornithologist, entomologist, and botanist may pursue their studies in the field. The story and structure of Hampstead Hill are given by Professor Lobley, whilst Mr. H. T. Warton discourses on its flora, the Rev. Dr. F. A. Walker on its insect fauna, and Mr. J. E. Harting on the birds. Lists of fossils, plants, insects, and birds are fully given. The illustrations are quaint, and in keeping with the work.

Palestine, by Major C. R. Conder (London: Geo. Philip & Son). This is a volume of the "World's

Great Explorers" series, and it will be a difficult matter for any subsequent volume to excel it. The story of the Palestine Exploration is one of the most interesting on record, and Major Conder relates it with the graphic skill of one who is a trained author and an ardent explorer. There is not a dull page in the book. It is full of realistic Oriental scenes and settings, whilst the work of the expedition is detailed in a manner which interests both Biblical students and general readers alike. There are seven chapters, devoted to the Explorations in Judea, the Survey of Samaria, Researches in Galilee, the Survey of Moab, Explorations in Gilead, Northern Syria, and one devoted to the Results of the Expedition. The introductory chapter relates the origin of the Expedition, and does generous justice to all those who have been concerned in it besides the author. We cordially commend this unusually pleasant book.

DISTRIBUTION AND HABITS OF THE BRITISH HYDROBIÆ.

By A. J. Jenkins.

In the "Journal of Conchology," for October 1889, there is a very interesting article, entitled "Notes on British Hydrobiæ, with a description of a supposed new species," by Edgar A. Smith, F.Z.S., of the British Museum of Natural History.

As there appear to be a great want of knowledge existing respecting the Hydrobiæ, perhaps a brief description of the recognised British species, with particulars of their distribution at home and on the Continent, together with a few remarks concerning the "supposed new species," may not be deemed out of place, and may possibly help to stimulate conchologists to more thoroughly study our various species and their varieties.

The interesting little molluscs belonging to this genus are very small, and they somewhat resemble the Rissoæ in external features, but differ from these more marine animals, in generally inhabiting brackish, and sometimes quite fresh water, as well as by the absence of the opercular appendage, or caudal filament. They agree with the Rissoæ in possessing a horny operculum, and long slender tentacles, and they have the muzzle-shaped head characteristic of the Litorinidæ. As some species inhabit estuaries within reach of the tides, while others prefer brackish and quite fresh water, they may be said to form a connecting link between the marine and freshwater mollusca; and, having regard to the freshwater confinement of some species, it would almost seem desirable to withdraw them from our British marine list, and include them amongst our freshwater shells. That Dr. Jeffreys was at one time of this opinion is manifest by his classing them in the family Paludinidæ, although he afterwards transferred them to the Litorinidæ, stating that, when he originally included them in the Paludinidæ, he had "not sufficiently considered their systematic relations." That the Hydrobiæ have for many years been somewhat of a puzzle to conchologists is clearly proved by the very dissimilar genera in which they have been placed during the past century; during which period they have been figured and described as Rissoa, Turbo, Litorina, Cyclostoma, Paludina, Cingula, &c., until finally Hartmann conferred upon them the present generic name Hydrobia.

Dr. J. Gwynne Jeffreys, in his splendid work "British Conchology," has described but three species of Hydrobia as being indigenous to the British Isles, viz.: *Hydrobia similis* (Draparnaud), *H. ventrosa* (Montagu), and *H. ulvæ* (Pennant).

The first species is very local in distribution in our own country, and is described by Jeffreys as being restricted to ditches on the marshes bordering the Thames from "Greenwich to below Woolwich." It has evidently been exterminated in this locality, and has migrated lower down the river, where it seems to be confined to very narrow limits. On the Continent, according to Jeffreys, it enjoys a very wide range, extending from "France south to Corsica," and in the south of Portugal, in running water and marshes. In France it inhabits quite fresh water. *H. ventrosa* and *H. ulvæ* are very generally distributed around the coasts of England and Wales; the former species has also been taken by Jeffreys at Larne Lough, Ireland, and the latter from Loch Carron in Stornaway, and in company with *H. ventrosa* from the famous Arnold's Pond at Guernsey. On the Continent, according to the same authority, *H. ventrosa* is found "in similar situations along the sea-coasts of Sweden, France, and Portugal, as well as in Algeria." A variety of *H. ulvæ*, var. *Barleei*, is described as inhabiting the Baltic. Of these species, *H. ulvæ* would appear to be the most marine in its habits, being always found within reach of the tides, frequenting mud flats, and ooze sands in profusion. The shell, which is long and tapering, is somewhat blunt at the apex, with seven or eight whorls of a yellowish or yellowish-brown colour. The animal is very sluggish and timid. *H. ventrosa* and *H. similis* inhabit brackish-water ditches, which are seldom, but occasionally overflowed by the tide. They may be taken together from their habitat on the Thames marshes. The shell of *H. ventrosa* forms a lengthened cone, with six or seven whorls, which are, as its specific name signifies, ventricose, or swollen. The body-whorl is less than half the height of the shell. The animal, which is very timid and sluggish, has a persistent habit of floating shell downwards upon the surface of the water. The shell of *H. similis* is shorter, and more oval in contour, with five or six rounded but compressed whorls, and a much shorter spire; the body-whorl is very round and expanded, and exceeds one-half the height of the shell. The suture is very deep and channelled, and the umbilicus is larger and deeper than in the other species. The animal is an active, pretty little creature, with a produced muzzle, and long tapering tentacles which are kept constantly in motion. The shells of the last two species from this locality are generally incrusted with a hard ferruginous deposit, completely enveloping the periostracum, but a few examples taken by me are of a clear, pellucid, horn colour.

Besides the species already described, I have for some years past taken other examples of Hydrobia which cannot satisfactorily be reconciled with either of the above species, and which do not appear to be known to the great continental Conchologists to whom they have been submitted. After a careful study of the living animals, and comparison of their external features with the two species which most nearly resemble them (*H. similis* and *H. ventrosa*), Mr. Smith has arrived at the conclusion that it is a new species, which he proposes to name *H. Jenkinsi.* Like the other species, they are gregarious, and, from their abounding in ditches in the neighbourhood of Plumstead and Beckton, they may for the present be denominated the Plumstead-Beckton Hydrobia. The shell, which has five volutions, is of a glossy dark

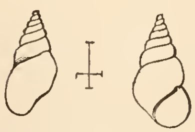


Fig. 61.—*Hydrobia ulvæ* (Pennant).

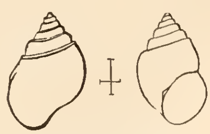


Fig. 62.—*H. similis* (Draparnaud).

olive colour, and is larger and more robust than the shell of typical *H. ventrosa.* It somewhat answers to Jeffrey's description of the variety ovata of *H. ventrosa*, and it has been considered by Mr. J. T. Marshall of Torquay to be that variety, which is described in "British Conchology" as follows:—"Var. 3 ovata, shell having a much shorter spire, consisting of only four whorls, which are more swollen than usual, and the last considerably exceeds one half of the shell." I have not at present seen any specimens of this variety with which to compare the Plumstead-Beckton shells; but as Jeffreys only mentions one locality—viz., Oxwich Marsh, near Swansea—probably it was not very well diffused at that time. But, although the shells may agree with the description of Jeffrey's var. ovata, the animals differ considerably from typical *H. ventrosa*, both in external appearance and in habits. As a matter of fact, they more closely resemble *H. similis*, but the tentacles are a trifle longer, and the eyes are placed upon dark-coloured instead of pale prominences. Upon careful examination, Mr. Smith is of the opinion that they "are not absolutely the same, and conchologically the two forms are distinct." The sole of the foot of *H. ventrosa*, with its central portion of a dark slate-colour, margined with white or stone-colour—described by Mr. Smith as caused by the "aggregation of numerous whity brown specks"—is distinctly different from that of the other species, both of which are of a pale grey tint. The animal also is more diminutive, the eyes are smaller and nearly sessile, and the tentacles are shorter, less tapering, blunt at the tips, and are more quiescent when the animal is crawling. They may also be distinguished from the others by their more constant habit of floating or swimming inverted upon the surface of the water. This they exhibit continually in all the aquaria in which I keep them, and if removed to very shallow water, just sufficient to cover them, they have recourse to the same habit. I have sometimes seen the other hydrobiæ floating, but this occurs but seldom, and not habitually, as in *H. ventrosa.* Mr. Smith has thus summarised the various distinctions between the Plumstead-Beckton Hydrobia and the other two species in the October number of the "Journal of Conchology":—"It differs from *H. ventrosa* (1) in habit, (2) length and form of tentacles, (3) colour of the foot and head, and (4) in the greater size and more robust form of the shells. Of the latter, some have simply rounded whorls; others exhibit more or less of an epidermal

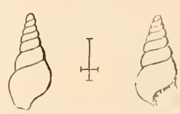


Fig. 63.—*H. ventrosa* (Montagu).

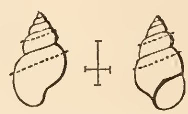


Fig. 64.—*H. Jenkinsi* (E. A. Smith).

carination towards the upper part of them (variety carinata of Marshall)."

"From *H. similis* it differs (1) in its greater length, higher spire, (2) less pronounced or unchannelled suture, (3) slighter umbilical chink, (4) its tentacles are perhaps the least trifle longer, and (5) the eyes are set on blackish instead of pale swellings."

The carinated shells to which Mr. Smith refers form by far the largest proportion of the specimens from both banks of the Thames. Strongly keeled specimens exhibit a well-defined line of a darker shade of colour, with little tufted projections at intervals, commencing at the edge of the outer lip, above the periphery, and extending round the body and two preceding whorls, giving the shell a somewhat turreted appearance. This carination is more or less apparent in a large majority of shells from all the localities at which I have at present taken them. Out of 2057 shells from the various localities, examined by me with a pocket lens, 1420 specimens proved to be more or less keeled; a few of these were very young, but the majority had reached the adult condition. The largest proportion of keeled specimens—viz., 85 per cent. on 882 shells examined—were obtained from one locality on the south bank of the river; specimens from near Beckton produced

71 per cent., the general average from all localities being $68\frac{1}{2}$ per cent. As these statistics clearly prove the fact that the carinated shells form by far the largest proportion, and as it is better to select the prevailing form as the type, I propose, with Mr. Smith's sanction, to consider the carinated form as the typical species, with the non-carinate shells as the variety. The synonym will then be as follows :—

Hydrobia Jenkinsi.—E. A. Smith.
Syn. *H. ventrosa*, var. *carinata*.—Marshall.
Var. *A. carinata*.—Jenkins.
= *H. ventrosa*, var. *ovata*.—Marshall (non Jeffreys).

It has been suggested that the carination is merely epidermal ; but, from observations that I have made, I am inclined to believe that the shell itself enters into the construction of the ridge. The keel and its minute projections, as they appear upon a strongly keeled specimen, cannot be removed by brushing, and, after being scraped with a pen-knife, the line and ridge can still be discerned with the microscope. Several shells and sections examined microscopically

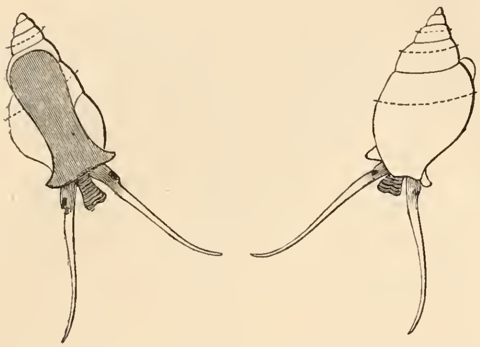


Fig. 65.—*H. Jenkinsi* (E. A. Smith) type. Dorsal and ventral aspect.

testify that the shell is minutely angulated to form the ridge, the lines of growth being interrupted and bent up towards it. One specimen, a dead shell in my possession, has the brown projections standing up in little tufts from the keel intact and prominent, although every particle of the periostracum has been eroded from the shell ; thus proving that they are of a much tougher nature than the epidermis.

Having kept the various species in Aquaria for many months, I have come to the conclusion that the Plumstead Hydrobiæ differ entirely from *H. ventrosa* in general habits, as well as in their external features. From various experiments which I have made with them, they appear to be more hardy, active, and vigorous, they flourish equally well in quite fresh water, or in brackish water from their own habitat. Indeed I have kept them for prolonged periods in hard tap water, containing small quantities of pond-weed, during which they have crawled about with their usual activity. Prolonged emersion of *H. ventrosa* in tap water has proved fatal to them, and they appear very dormant and inactive in fresh pond-water. The former species are also less timid, much more active, and generally prefer crawling about the water-weeds or upon the glass sides of the aquarium, and are seldom seen floating. They also make more use of their long slender tentacles, which seem to perform some important functions for them.

The Hydrobiæ appear to subsist principally upon decaying vegetable matter. The Plumstead species may be taken in abundance from masses of Chara, and the bright green ribbon-like algæ peculiar to brackish water, which I imagine is a species of Ulvæ. They often frequent the same ditch, in company with such freshwater congeners as *Limnæa peregra*, *L. truncatula*, and *Planorbis*, as well as with the more marine species *Assiminia Grayana*. According to Jeffreys several species would seem to have been introduced into this country at various times. Some years ago Mr. Pickering found some shells about two miles below Gravesend (together with a single specimen of *Litiopa bombyx*), which Jeffreys con-

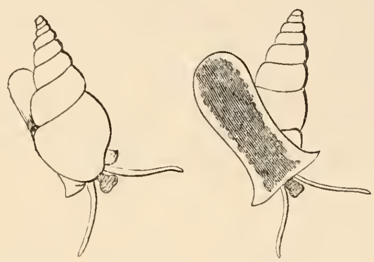


Fig. 66.—*H. ventrosa* (Montagu) type. Crawling and floating.

sidered closely resembled a Cape of Good Hope species of Hydrobia. Dr. Jeffreys and Mr. Pickering upon several occasions made diligent search in the same spot, but failed to discover any more specimens. From the fact of *Litiopa bombyx* being peculiar to the gulf-weed, Jeffreys surmised that probably both of these shells were brought into the Thames by some inward bound vessel, attached to the keel, rudder, or chains, and had been carried by the tide into the ditch where Mr. Pickering discovered them. Dr. Jeffreys mentions in "British Conchology" that many years before the late Mr. G. B. Sowerby submitted to him two specimens of *H. Ferrussina* which Mr. Sowerby said had been found in Hampshire. He states that this species, as well as *Helix obvoluta* (which is confined to the same county in this country) inhabit the greater part of France, and expresses the probability that *H. Ferrussina* may also turn up in the south of England. According to the same author *Hydrobia marginata*, which now inhabits the south and south-west of France, as well as the Jura and Switzerland, was a very long time ago an inhabitant of our own country, but it is now extinct as a British species. It has been found fossil in various parts of England as well as on the Continent.

In searching over my treasures a short time ago, I came across a box containing a small quantity of a curious deposit containing freshwater shells, which was given to me by Mr. Storrie, the curator of the Cardiff Museum, in 1888. The deposit which was found eighteen feet below the surface in the excavations for Barry Dock, near Cardiff, contains numerous shells of *Limnæa peregra*, as well as a number of spiral shells which much resemble *H. ventrosa*, and which undoubtedly is that species.

In conclusion, I should like to add that, should our Plumstead–Beckton species prove to be quite unknown to conchologists, it will be rather interesting to try and discover from whence it originated. If it is an introduced species, where did it originally come from, and by what means? We have ample proofs that several of our British shells have been introduced, and have adapted themselves to our varying climate. *Dreissina polymorpha*, which was introduced here from America, has flourished so as to prove rather a nuisance in our canals and rivers, and *Bulimus Goodallii*, which was originally brought over from Guadaloupe in 1822, has since that time spread from greenhouse to greenhouse, in various parts of England.

The illustrations, which were taken from my own specimens, are enlarged about two diameters for the shells, and four diameters for those representing the animals as they appear when crawling.

New Cross.

A DEEP CHANNEL OF DRIFT IN THE VALLEY OF THE CAM, ESSEX.

A VERY interesting paper was recently read before the Geological Society on the above subject by W. Whitaker, Esq., B.A., F.R.S., F.G.S. In Scotland and in northern England long and deep channels filled with drift have been noticed, but not in southern England. For some years one deep well-section has been known which showed a most unexpected thickness of glacial drift in the higher part of the valley of the Cam, where that drift occurs mostly on the higher grounds and is of no very great thickness. Lately, further evidence has come to hand, showing that the occurrence in question is not confined to one spot, but extends for some miles. The beds found are for the most part loamy or clayey. At the head of the valley various wells at Quendon and Rickling show irregularities in the thickness of the drift, the chalk coming to or near the surface in some places, whilst it is nearly 100 feet below it sometimes. Further north, at Newport, we have the greatest thickness of drift hitherto recorded in the south of England, and then without reaching the base. At one spot a well-reached chalk at 75 feet; whilst about 150 feet off that rock crops out, showing a slope of the chalk-surface of 1 in 2. In the most interesting of all the wells, after boring to the depth of 340 feet, the work was abandoned without reaching the chalk, the drift in this case reaching to a depth of about 140 feet below the level of the sea, though the place is far inland. The chalk crops out about 1000 feet eastward, and at but little lower level, so that there is a fall of about 1 in 3 over a long distance. At and near Wenden the abrupt way in which drift comes on against chalk has been seen in open sections. Two wells have shown a thickness of 210 and 296 feet of drift respectively; and as the chalk comes to the surface, at a level certainly not lower, only 140 yards from the latter, the chalk-surface must have a slope of 1 in less than $1\frac{1}{2}$, and this surface must rise again on the other side, as the chalk again crops out. The drift here reaches to a depth of 60 or 70 feet below the sea-level. At Littlebury, in the centre of the village, a boring 218 feet deep has not pierced through the drift, which reaches to 60 feet below the sea-level. As in a well only 60 yards west and slightly higher, the chalk was touched at 6 feet, there must here be a fall of the chalk-surface of about 1·2 in 1. Eastward, too, on the other side of the valley, the chalk rises to the surface. The places that have been mentioned range over a distance of 6 miles. How much further the drift-channel may go is not known, neither can we say to what steepness the slope of the underground chalk-surface may reach; the slopes given in each case are the lowest possible. Mr. Whitaker thinks that the channel has been formed by erosion rather than by disturbance or dissolution of the chalk.

ILLUSTRATIONS OF VEGETABLE TERATOLOGY.

THERE is nothing more suggestive to a botanist than the singular floral shapes which members of the same orders of plants run into. Geologists cannot tell with precision the exact period when gaily coloured flowers came into existence. We can trace back many wind-fertilised plants, such as oak, maple, etc., to the lower cretaceous period. Practically, all the existing orders of insect-fertilised, and therefore beautifully coloured, adorned, and perfumed flowers have well evolved during the tertiary period. The degree of evolution has probably proceeded from polypetalous to gamopetalous types of flowers; and from regular gamopetalous to irregular kinds. Thus, "sports" may sometimes be a kind of spurting onward, although they are more frequently reversions to older stages of floral development.

Take the order Scrophulariaceæ, for example. It includes flowers like those of the Speedwells, whose four petals are only just united together. It seems as if the slightest change would take them back to a polypetalous condition. The Germander Speedwell (*Veronica chamædrys*) is nearly a regular flower—that is, its petals are nearly all the same size and

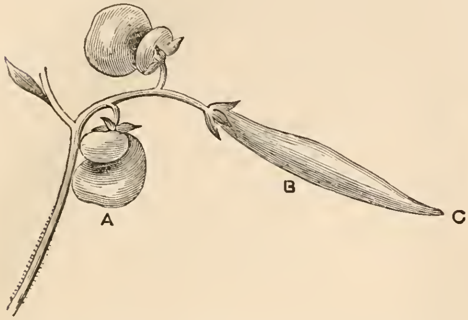


Fig. 67.—Monstrous Calceolaria. A, ordinary corolla; B, elongated hollow corolla, terminating at a small opening at C. Reduced one-third.

Fig. 70.—Monstrosity (Synanthy) in common Foxglove.

shape. In other species of the same genus, both size and shape of two out of the four petals vary considerably.

Thence, to perhaps some of the most irregular types of gamopetalous flowers are all included in this order. Take the genus Calceolaria for instance.

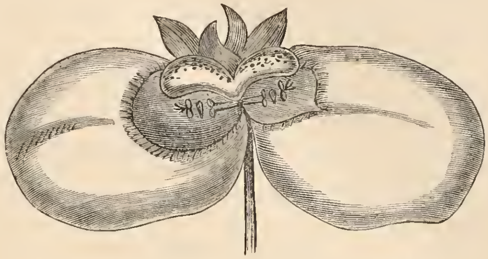


Fig. 68.—Malformation of Flowers of Calceolaria.

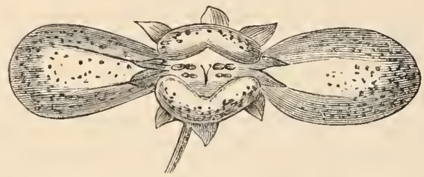


Fig. 69.—Malformation of Lips of Calceolaria.

Fig. 71.—Monstrous Foxglove.

The whole of the floral effort seems to have been thrown into the evolution of the shoelike lower part, which has obtained for it its botanical name. There are fewer garden flowers which "sport" more freely. That is to say, seeing the genus has run to the extreme of floral specialisation, we cannot wonder if we find numerous instances of reversion to some one or another of the stages through which this genus has passed. These may appear as "sports" or "monstrosities."

The order Scrophulariaceæ, notwithstanding its exalted floral specialisation, has an exceedingly wide-spread geographical distribution. This means that its members must have been in existence a sufficiently long time, geologically speaking, to allow of their being distributed, through the agency of the numerous geological changes which took place, climatal and physical, during the tertiary epoch. What ups and downs, literally and figuratively, took place over the same terrestrial during the millions of years represented by that period! We know for a fact that the climate of the tertiary epoch, even in England, began as Tropical, and ended as Arctic. Plants are even more sensitive to temperature than animals. No wonder, therefore, they should respond to these slowly but surely occurring changes by floral and other modifications. All that we know of these are the species of each order left to us. What countless hosts must have gone down in the bitter fight! All that we know of are the old veterans which have "survived." Perhaps some floral "monstrosities" resurrectionise some of these forgotten forms for us—who can tell?

J. E. TAYLOR.

NOTES ON MARINE MOLLUSCA IN CAPTIVITY.

By ALBERT H. WATERS, B.A., M.C.S.

I AM a shell collector myself, so can bear witness to the delights of that pursuit. Nevertheless, I am bound to confess that I find more pleasure, for my part, in investigating the habits of living mollusca than in accumulating specimens of lifeless and shells of defunct and vanished univalves and bivalves. I have long kept living specimens of marine mollusca in my aquaria, and a few notes upon their ways may possibly prove interesting.

To begin with, the common and well-known edible whelk (*Buccinum undatum*) is one of the species I have kept in captivity, and I have found that, with care, small specimens will live and thrive for months; but the dog-whelk (*Nima reticulata*), so plentiful on our shores, is, as far as my experience goes, hardier than *Buccinum undatum*, and lives and flourishes better. Both species like shallow water best, and spend much of their time out of that element, living a sort of amphibious existence, in their fondness for which they resemble the common periwinkle. I feed them generally with scraped meat, and they eat it fairly well; but their preference is for a piece of dead fish or freshly killed mussel. They are nocturnal in their habits, and I have never observed them feeding in the daytime. By taking a light to the aquarium after dark, they may be observed actively crawling about in the direction of the meat, and their sense of smell is so keen that they soon scent it out; in the daytime they take no notice of it. *Nima incrassata* has similar habits, but is perhaps a trifle less hardy than *reticulata*.

Polytropa lapillus I have found requires extreme care in regulating the density of the water, for if it be either allowed to get too salt, or be made over fresh when the loss by evaporation is replaced, the mollusc will die. Its favourite food is a fresh mussel, and it does not take kindly to the scraped meat with which I feed the other carnivorous denizens of my aquaria.

Periwinkles thrive remarkably well in my vases. I have had the same individuals for ten years, and they breed freely. They must be very long-lived creatures, for they seem to grow very slowly. The young ones are at first quite unlike their parents, and it is quite three years before they begin to assume anything like the familiar form of "a winkle." Their shells are thin, brown, and inclined to a fusiform shape.

The common periwinkle (*Littorina littorea*) is the hardiest and most easy to keep, but I have found others of the genus, such as *L. rudis*, thrive very well and give but little trouble. All the species are very useful; they are so fond of crawling on the glass of the aquarium that they eat off the minute algæ so apt to grow thereon as fast as it appears, and thus help to keep the front of the aquarium clean.

I cannot now enumerate all the species of mollusca I have successfully kept. I will merely mention the trochus, the limpet, the chiton, the pholas, and the common mussel. The first-named of these is rather troublesome, the limpet less so. The chiton is very hardy and bears confinement well, and is as useful an inmate of the aquarium as the periwinkle, and for the same reason. I have had under observation in my aquaria *Chiton fascicularis*, *Chiton cinereus*, *Chiton ruber*, and *Chiton asellus*, but have not noticed much difference in their habits. They are particularly fond of crawling on the glass, and are then very handy for examination with a lens.

The common mussel is difficult to keep alive for any length of time when introduced in an adult state, but young individuals frequently make their appearance and live a long time. The young mussels are very locomotive, and seldom remain long at one spot.

LOCAL NAMES.—A similar name to that quoted last month for "Water Hemlock," by the Rev. S. A. Brennan, is in use in North Yorkshire. Here all the larger umbelliferæ are known as "Kelks."—*J. A. Wheldon, Leeds.*

THE FLORA OF GUERNSEY.

By E. D. Marquand.

THE Channel Islands present to the naturalist a field of research scarcely to be equalled in many respects in northern Europe. Their easy accessibility, their convenient size, so to speak, being neither mere rocky islets, nor extensive tracts too large for single-handed work; their mild climate, the surpassing beauty of the scenery, and withal an exceedingly rich fauna and flora, all render this little group peculiarly attractive and promising. Politically, the Channel Islands belong, of course, to England; but geographically, and to a very large extent zoologically and botanically also, they certainly belong to France, from which mainland they have become separated within a geologically recent period.

Of the entire group Guernsey may be considered typical, from its medium size compared with the other islands, whilst its remoteness from land, being the most westerly of all (fifty-one miles south of Portland, and nearly thirty from the nearest point of the French coast) marks it as the one to which we should look for any peculiarity in the natural history of the little archipelago, and as undoubtedly the best field for studying the effect of insularity upon races of animals and plants.

The shape of Guernsey is as nearly as possible a right-angled triangle, the longest side, nine or ten miles in length, being presented to the north-west, and broken by a succession of rocky or sandy bays. The southern side (forming the base of the triangle) extends about seven miles, and forms an elevated plateau, rising rather more than three hundred feet above the sea. The cliffs are precipitous and rocky, intersected by deep valleys opening into little coves. From about the middle of the island the land slopes gradually, until at the northern and north-western edges it has fallen nearly to the sea level. The coast scenery is certainly not surpassed by the finest bits of Devon or Cornwall. The area of Guernsey is about twenty-five square miles.

During the years 1837 and 1838 Professor C. Cardale Babington spent some time in the Channel Islands, and devoted his attention to the flowering plants; the result of his researches was the publication in 1839 of his "Primitiæ Floræ Sarnicæ," a concise and handy little volume which remains to this day the best flora of the Channel Islands extant, in fact the only one of any scientific value at all. In the fifty years that have intervened, however, great changes have taken place in the larger islands; much waste land has been brought under cultivation, marshes and bogs have been drained, a large number of quarries have been opened up and extensively worked, and in various ways the face of the country has become greatly altered, with the consequence that many wild plants have disappeared from their old habitats and some will never again be found here.

Professor Babington records for the whole of the Channel Islands collectively eight hundred and forty-eight flowering plants and ferns, of which five hundred and fifty-three are noted as occurring in Guernsey. But this is somewhat below the mark, for during the present year (1889), working assiduously at this branch of study, with especial regard to the local distribution of the species, I have collected between fifty and sixty unrecorded for this island, so that the phanerogamic flora of Guernsey may be set down at something over six hundred species. Eighteen ferns are indigenous to the island.

It seems to be an almost invariable rule in local lists that whilst attention is always directed to the rarities of the district, no notice whatever is taken of the absence of any usually common species, which, from some cause or other difficult to discover, are not represented at all. Yet surely these deserve to be carefully noted, because the absence of one commonly distributed plant may go further towards the unravelling of some knotty point connected with the distribution of species, than the presence of half-a-dozen rarities which possibly at some time have been accidentally introduced. Here in Guernsey, for example, the absence of several plants which are common all over the south of England is quite marked, and cannot fail to be noticed by any moderately experienced and observant botanist. Let me mention some of these: *Erica tetralix*: not a stem of this common heath grows in the island, though its two congeners, *E. cinerea* and *Calluna vulgaris*, are abundant. *Stellaria holostea*: has never been found in Guernsey. *Mercurialis perennis*: does not occur here at all, although *M. annua* is one of the most abundant weeds in fields and gardens. *Campanula rotundifolia*: unknown in the Channel Islands, as it is also in West Cornwall. *Solidago virgaurea*: does not occur in Guernsey. *Anthyllis vulneraria*: I have failed to find any trace of this plant, although Babington recorded it for Guernsey; perhaps it is lost. The genus Drosera is not represented at all. *Caltha palustris*: unknown in Guernsey. *Anemone nemorosa* and *Briza media*: likewise unknown here.

Now these plants, and others which might be specified, are such as one would reasonably expect to find here, and their absence is suggestive. It would be interesting to trace out, as far as possible, the probable causes which have prevented them from spreading as far, for we can hardly suppose that they once existed and have become extinct. Their case is exceptional, too, for nearly every one of the very common plants of Guernsey are very common also in the south of England.

It is manifestly impossible in a paper of this kind to give anything like a full account of the flora of even so small an island, but the following notes will serve to indicate how very rich in wild plants the place is, and what good things may reward the botanist who contemplates a visit.

First, I will enumerate some of the rare British plants which are indigenous to Guernsey; and by rare I mean such as, according to the London Catalogue, have a comital census not exceeding ten; in other words, plants which are only known to occur in not more than ten out of the 112 counties and vice-counties into which Great Britain is divided. The notes appended to each species refer, of course, to the island of Guernsey only. *Matthiola sinuata:* not uncommon on the northern coast. *Polycarpon tetraphyllum:* abundant in all parts. *Herniaria glabra:* local, but plentiful where it occurs. *Silene conica:* rather rare; grows among short herbage on commons. *Hypericum linariifolium:* this plant I have seen only on one part of the southern cliffs, in a few places. *Erodium moschatum:* generally distributed, and not uncommon. *Lotus hispidus:* common, especially on the coast. *Lotus angustissimus:* rare. *Arthrolobium ebracteatum:* I know only one station for this plant, where it grows in a very limited area. It occurs in the Scilly Isles, but has never yet been found on the mainland. *Tillæa muscosa:* in several spots on the higher part of the cliffs. *Bupleurum aristatum:* very rare; known as yet only in one habitat. *Cicendia filiformis:* very rare; apparently confined to one small spot at the northern end of the island. *Scrophularia scorodonia:* tolerably frequent. *Sibthorpia Europæa:* very rare. *Rumex rupestris:* in small quantity on the western side. *Euphorbia peplis:* recorded by Babington for Guernsey, but not found by me, though no doubt it still occurs on the same part of the coast. *Arum italicum:* rare. *Asparagus officinalis:* noted by Babington; I have not seen it. *Scilla autumnalis:* frequent on the coast, all round the island. *Allium triquetrum:* abundant in all parts. *Spiranthes æstivalis:* plentiful in the only bog in the island. This boggy piece is but a few acres in extent, and should it be reclaimed, as most likely it will be before long, some of the rarest plants in the Sarnian flora will be lost. *Trichonema columnæ:* common on the coast line generally, but especially abundant on the cliffs. *Juncus capitatus:* I have found it in several places, always near the sea; probably not rare, though from its diminutive size it easily escapes detection. *Cyperus longus:* common in wet meadows all over the island. *Cynodon dactylon:* plentiful and fine in one place on the north-western coast. *Briza minor:* occasional. *Chamagrostis minima:* common on the cliffs, and also here and there on sandy shores. *Polypogon monspeliensis:* rare.

This is a fairly good list of British rarities for so small a district, the majority of the above being restricted to only a very few English stations.

And now I will proceed to mention such plants as are peculiar to the Channel Islands, or to Guernsey in particular; or rather, to speak more correctly, those which are not represented in any other part of the United Kingdom. I have not at hand at this moment detailed information upon the range of these species on the Continent, so I can say nothing on that point at present; but it will be seen that this list is a singularly interesting one, and, whether or not these plants be accepted as properly belonging to the British flora, it is at least something to know that they are now to be found wild in the island of Guernsey. *Centaurea aspera:* plentiful in the only locality I know for it, on the north-western coast. At a little distance it rather resembles *C. nigra*, though it is a handsomer plant. *Gnaphalium luteo-album:* occasional in moist places on the northern side; cannot be mistaken for anything else. *Cicendia pusilla:* a most minute species, growing sparingly in one spot only, so far as I know. It is quite hopeless to look for it unless the tiny mauve-pink flowers are open (July), and even then it requires some patient searching on hands and knees to find it. *Orchis laxiflora:* common in moist meadows in all parts of the island, but especially abundant about the middle of the north-western side, where at the beginning of June the fields are quite purple with these flowers. It is a most beautiful plant, and unquestionably the finest of the genus as represented in Britain. *Lagurus ovatus:* abundant in all low-lying sandy places on the coast. *Cynosurus echinatus:* very rare, according to my experience. *Bromus maximus:* rare, and confined to a few spots at the west of the island. These three grasses are quite unlike any other British species. *Gymnogramma leptophylla:* the so-called "Jersey fern;" at present known only in a single station, where it grows in some plenty. *Ophioglossum Lusitanicum:* occurs in several places on the coast line, but chiefly on exposed cliffs. It is extremely difficult to find this small fern, as it grows in patches a few feet square with nothing to indicate why it favours one spot more than another. The fructification is at its best about March. *Isoetes hystrix*, var. *subinermis:* this curious plant is not very uncommon on the northern coast, though not easily found until the eye has learnt to recognise it, for it looks very like a young plant of the common thrift. But Isoetes always grows singly, and not compacted into a cushion, and the large spinous bulb at once distinguishes it.

The indigenous ferns are, as I have said, eighteen in number. The best worth notice, besides the two just mentioned, are: *Osmunda regalis*, once tolerably plentiful, but now nearly eradicated, thanks to the insatiable rapacity of senseless fern-grubbers; *Asplenium lanceolatum*, abundant everywhere; *A. ruta muraria*, frequent, especially on the old church walls; *A. marinum*, common on the coast, mostly now in inaccessible places; *A. trichomanes* and *Ceterach*, rare; and *Ophioglossum vulgatum*, very local. I have collected two or three different

Charæ in the island, but have not yet satisfactorily identified them.

From the above notes some idea may be formed of the peculiarities of the Sarnian flora. It certainly approaches that of Western Cornwall more nearly than any other part of the south of England; and yet it is quite distinct. Many of the common Cornish plants are either extremely rare, or (like *Lastræa æmula* among the ferns) absent altogether; and yet to all appearance all the circumstances favourable to their growth are at hand. I find this even more noticeable, however, with the mosses, for I miss here a large number of my familiar Cornish friends.

That a considerable number of good plants have become extinct during the last sixty years or so is most certain. Down to the commencement of the present century the sea at high spring-tides flowed over a large low-lying tract of land, so that the northern portion of the island became during such times completely detached and insulated. Subsequently, this periodically submerged tract was reclaimed, the sea being kept back by solid masonry at each end. Scattered over this recovered ground were many brackish pools and salt marshes, and these remained until within recent years the habitat of many a rare flower. But now these pools and marshes are gone. The rage for greenhouse-building has brought about the drainage and improvement of much land hitherto uncultivated, with the result that, however beneficial this may have proved to the genus Homo, the indigenous flora has suffered irretrievably. On the other hand, certain species, like *Veronica Buxbaumii* and *Allium triquetrum*, have spread all over the island, though apparently unknown here in 1839 when Prof. Babington wrote the "Flora of the Channel Islands."

As an example of a strictly foreign species which has now become thorougly naturalised, may be mentioned *Gunnera scabra*, a huge plant which thrives in sheltered valleys on the margin of pools and streamlets. It resembles a gigantic sort of rhubarb with leaves four or five feet across, and leafstalks of proportionate length and size. Strangers commonly regard it as one of the vegetable curiosities of the place. A few years ago it was entirely confined to private grounds.

I will not enter upon the subject of local variation as applied to plants; but in all probability it will abundantly repay careful attention. Amongst insects it is very striking. Besides many species unrepresented elsewhere in the United Kingdom, we have here distinctly marked races, which entomologists assert are peculiar to the islands, and it is very remarkable that in some instances each of the larger islands possesses a varietal form peculiar to itself. And it may be so with the flowering plants. Certain it is that so complete an isolation, extending back for untold thousands of years, with cross fertilisation reduced, one might say, almost to a minimum, cannot fail to have produced some effect upon the indigenous vegetation of such a limited area.

Fermain House, Guernsey.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

The Microscopical Society of Glasgow: President, Dr. Dallinger; Hon. Secretaries, M. Ballantine, 16 Glassford St., Robert Williamson, 137 Ardgowan Street. Meets on third Wednesday of each month from September to April inclusive, in Anderson's College, George St., at 8 p.m.

Haselmere Microscope and Natural History Society: President, Colonel Mason; Vice-President, Mr. F. S. Fowler; Hon. Secretary, Mr. Chas. Pannell, junior, East Street, Haslemere. Meets on first and third Mondays in the month at the Institute, High Street, Haslemere, at 7.30.

SCIENCE-GOSSIP.

THE February number of the "Geological Magazine contained an important article by Mr. J. G. Goodchild, on "The Paste of Limestone." In the first place he reviews the chief of the old theories which have been brought forward to account for the deposition of the limy binding matter of limestones. He considers that none of them satisfactorily account for the great amount usually present. His idea is that the carbonate of lime contained in the water of a river when it reaches the sea is affected by the sulphate of magnesia in the sea-water. Double decomposition ensues, and carbonate of magnesia and sulphate of lime are formed. This latter is taken up by organic agencies, and on their decomposing again becomes carbonate of lime, and is thrown down as a precipitate.

THE last number of the "Journal of Microscopy and Natural Science," with which, it will be remembered, is incorporated the "Wesley Naturalist," contains the following interesting articles:—"The Parasitic Fungi of Insects," by George Norman; "Dips into my Aquarium," by Rev. W. Spiers; "On Certain Phenomena of Hypnotism," by Mrs. Bodington; "On a Simple Tank Microscope," by C. Rousselet; "The Pine Destroyer (*Hylurgus piniperda*)," Rev. H. Friend; "A New Staining Method," by J. W. Gatehouse; "The Indian Chank Shell, *Turbinella pyrum* (Lam.)," Rev. C. Crawshaw; "Note on the Binary Subdivision of *Micrasterias denticulata* (Breb.)," S. Helm; "Elements of Microscopy," by E. C. Bousfield; "Zoological

Notes at Port St. Mary, Isle of Man," by A. Chopin; "Aspect of the Heavens: April, May, June, 1890," by A. Graham, etc.

Mr. Clement Wragge, Government meteorologist of Queensland, sends us his very interesting and instructive meteorological report for 1887. We believe this is the first time anything of the kind has been attempted in Queensland, and it certainly is a most creditable performance. The report is illustrated with a great number of diagrams, weather charts, &c., all showing that the greatest care and precision have been expended to make them successful.

We have received from the U.S. Department of Agriculture the following important pamphlets:—"The Root-Knot Disease of the Peach, Orange, and Other Plants in Florida, due to the Work Anguillula," by Dr. J. C. Neal; "Report of a Trip to Australia to investigate the Natural Enemies of the Fluted Scale," by A. Koebell; and parts 7, 8, and 9 of "Insect Life." The importance of these pamphlets to agriculturists cannot well be exaggerated. That on the root-knot disease is a most exhaustive one, and is very fully illustrated, containing twenty-one plates printed in colours.

"Perspective Charts for use in Class Teaching," by H. A. James (London: Chapman and Hall), is a most useful book for a teacher of perspective.

Mr. H. W. Marsden, 21 New Bond Street, Bath, sends us two of his egg-drills, with a grooved conical tip. The advantage of these instruments over the primitive pin is very great. One can make a round hole of what size he likes, and there is no risk of breaking the egg. Mr. Marsden's priced catalogue of British and foreign birds' skins and eggs, animals' skins, Lepidoptera, British and foreign shells, and all kinds of natural history appliances and books, will be found valuable to all those in search of information in any or all of these subjects.

Among the exhibits worthy of special notice in the science department (under the direction of the Reverend Dr. West and Mr. C. Carus-Wilson) of the Bournemouth Industrial and Loan Exhibition, opened on the 7th inst., we may draw attention to the collection of British and foreign oysters lent by the Poole Oyster Fishing Company, also to a collection of birds' eggs, for which Mr. Gray received a special prize. Mr. E. Davies exhibited a most interesting collection of recent and fossil local shells, and on account of its perfection, and the skill shown in mounting, he was awarded the first prize. The processes employed in the development of photographs formed an interesting series, exhibited by Mr. Jones. In the geological section the large specimens of fluor-spar lent by Dr. West were much admired, and his collection of eocene fossils from the London, Hants, and Paris basins formed a most valuable addition to the list of exhibits. Mr. C. Carus-Wilson lent a case of remarkably well-preserved fossils of various geological ages, including a gigantic shark's tooth (carcharodon) from Rio; also garnets in quartz, and samples of musical sands. Leaves from the Bournemouth beds were well represented by Mr. Bennett's collection. In the entomological section Mr. McRae's splendid collection of British Lepidoptera attracted much attention; the Rhopalocera and Macro-Heterocera are nearly all represented, a large number having been bred by Mr. McRae from larvæ obtained in or near Bournemouth. A special prize was awarded to W. Harding for a large astronomical telescope constructed entirely by himself—quite a marvellous production for an amateur; it possesses three powers on revolving eye-tubes, speculum 9·3 inches diameter, two-inch achromatic finder, slow motion in R.A., and will divide stars 0·6 asunder. Some interesting "Voice Pictures" were shown by Mrs. Watts Hughes. Though not in the science department, Mr. C. J. Bayley's auto-pneumatic fountains are well worthy of notice; by an ingenious contrivance, which is worked by compressed air, they play for eight hours without attention. The exhibition will close on the 21st inst., when the prizes will be distributed by the Duchess of Albany.

On the 2nd inst. Mr. Ernest Spon, A.M.I.C.E., read a paper before the Civil and Mechanical Engineers' Society. After describing bygone blasting powders, and the early forms of gun-cotton and nitro-glycerine, Mr. Spon came to modern explosives, which he described in detail. These included dynamite, blasting gelatine, roburite, securite, smokeless blasting powder (S. B.) and others. While speaking of the manufacture of gun-cotton, he said that in one manufactory there is an annual output of 3500 tons. The Picrate compositions were touched upon, with the various forms of detonators, and their practical effect was discussed.

On April the 23rd, Mr. William Whitaker, F.R.S., F.G.S., of the Geological Survey, delivered a highly important address before the Society of Arts on "Coal in South-Eastern England." Mr. Whitaker, as far back as February 1886, in a paper read before the Geological Society, recommended Dover as a site for an experimental boring for coal beneath the chalk.

MICROSCOPY.

Micro-Photography.—Dear Editor, permit me to pass a few comments upon the article headed "Micro-Photography," which appeared in the March number. If Mr. D. W. Barker will allow me, I should like to point out a mistake which he has made in the title. The proper term to use is photo-micrography, and not micro-photography. The difference between the two is very great; for, whilst photo-micrography means photographing minute objects enlarged by the microscope, micro-photography is photographing large objects on a reduced scale on glass slips for examination with the microscope. Various views are treated in this manner, and can be bought at the optician's. Mr. Barker seems also to have overlooked one very important point in his ingenious contrivance, viz., stability, or, more correctly speaking, rigidity. It will be seen by the sketch that the camera back is only supported by one of its sides, and that very insecurely by the rackwork and pinion. Now, as a professional photographer of some years' experience, I can answer for the necessity of absolute firmness in all the apparatus connected with photo-micrography, and, unless this is attended to clearness of definition will not always be obtained. This defect might be overcome by attaching a strip of brass to the top of the camera front, having in it a long slot, and when the focus has been determined it could be fastened firmly to the top of the camera back with a milled edge screw. This is very frequently found on cameras which require to be held very rigid. If the focussing arrangement works loosely it must be tightened up, or want of rigidity will be caused by this way. In focussing it is always best to use a focussing-glass, which can be obtained at the photographic opticians for about half-a-crown. Should your readers require to know anything at any time in connection with photography, I shall always be pleased to inform them through the medium of your interesting journal. I trust Mr. D. W. Barker will excuse me for having corrected him.—*Roland Whiting.*

"FIXING" CELL CONTENTS.—Can any one tell me what takes place when the cell contents of animal or vegetable tissue are "fixed" by alcohol or some other liquid? I suppose the word means that the protoplasm is preserved in its original state unchanged. But I should like to know what is the real nature of the operation of the fixing agent; also what book there is which explains the reasons of the process made use of in microscopical research. There are plenty of books on manipulation, but I cannot meet with any explanation of processes.—*A. P.*

MOUNTING FRESH-WATER ALGÆ.—I have tried many mediums for mounting fresh-water algæ, and find the best to be a solution of acetate of potash in water. It does not alter the chlorophyl, and preserves the colour fairly well in most species, and perfectly in some. A fluid ounce of water to half an ounce of the potash is the recipe. Should anything like crystals form in the mount, the solution should be weakened by the addition of more water. Farrant's medium is the next best; I often use it, and produce most satisfactory results; but the objects to be mounted in it must previously remain for a couple of minutes in the "1, 2, 3," or "Gwa" mixture. The "Gwa" mixture is composed of glycerine 1 part, water 2 parts, and alcohol 3 parts. After this preparation the Farrant does not effect much alteration of the chlorophyl.—*H. W. Lett.*

PRESERVATION OF MELICERTA RINGENS.—Since this rotifer is often spoken of as being difficult to preserve for any length of time in captivity, it may perhaps be interesting to your readers to learn that I have had it in my aquarium for something like twelve months without any interregnum. Last spring I had only a few, but all summer and up to quite late in the autumn they were very abundant, in numbers far too great to count, but certainly many thousands were to be seen. During the winter they somewhat diminished in number, but are now fast becoming as numerous as ever. My aquarium is only a small bell-glass ten inches in diameter, having in the bottom a small quantity of clay with small stones and sand over it: in the aquarium are growing the following plants, namely *Fontinalis antipyretica*, *ceratophyllum*, *riccia fluitans*, *Lemna minor*, the only animal life apart from the microscopical organisms being one stickleback and a few living planorbis. Aspect S.W. Melicerta was accidentally introduced into the aquarium nearly two years ago on a piece of *potomogeton crispus*, together with *Limnias ceratophylli*, both becoming abundant upon myriophyllum, but according to its habit this latter plant upon the approach of winter broke up, and the Limnias has never reappeared. So far as my experience may be any guide, fontinalis and ceratopyllum are very good plants for a small aquarium; Riccia also does well. Can any of your readers tell me if Melicerta has ever been preserved for the same length of time.—*J. N. Measures, M.R.C.S.E.*

NOTE ON CHÆTOSPIRA MÜLLERI.—Last month I found *chætospira mucicola* on some chard. On and within the tissues of the same plant was the beautiful *animalcule, chætospira Mülleri.* The following extracts regarding the latter from Pritchard may be of interest: (1) "Slender; the first cilia of the series upon the process are somewhat but not remarkably longer and stronger than the rest; when rolled up the ciliated bacillar process forms more than one turn of a spiral. Sheath, flask-shaped and horny. Hitherto found only in the open cells of torn leaves of *Lemna triscula*, growing in fresh water near Berlin." (2) "Chætospira, a new genus instituted by Lachmann, has a ciliary apparatus so abnormal and peculiar that it would seem rather a representative of another family than one of the Vorticellinæ. The anterior portion of the body is much elongated, and supports a ciliated process, when fully extended, straight and of a sword-shaped figure, fringed along one side and at the end with cilia ; but when in active vibration, and twirling the animalcule onward in a spiral manner, the greater part of this ciliated process becomes curved like a sickle." The above describes some specimens that I looked at, though the form varied greatly in different specimens—in fact, the same creature at different moments sometimes presented changed appearances. Since Pritchard wrote his description, this animalcule has been found in various parts of this country—*e.g.* in Essex, Berkshire, Somersetshire, and Yorkshire, inhabiting a deserted limnias tube, duckweed, water-crowfoot, and chard respectively (my specimens favoured the vicinity of the terminal buds). Mr. M. C. Cooke says it is probably not uncommon. Lieberkuhn asserts that he has often found them swimming freely in the water. Unquestionably they can exist in a motile form ; for, when violently agitated, some were detached from the chard, and swam easily, their path forming a left-handed spiral. But under normal conditions they were all stationary. Reproduction probably takes place in several ways. On one occasion the appearance was that the creature detached itself, and, after shortening its body, ejected a round embryo from its posterior end.—*Ernest Hanwell.*

ZOOLOGY.

THE LOVES OF THE ROTIFERA.—In Dr. Hudson's admirable Anniversary Address to the Royal Microscopical Society, there occurs the following humorous incident :—" Mr. W. Dingwall, of Dundee, was on one occasion watching a male floxule circling giddily round a female, and constantly annoying her by swimming into her fully-expanded coronal cup. Again and again she darted back into her tube, only to find her troublesome wooer blocking up her cup, and sadly interfering with what to a floxule is the very serious business of eating—for these animals will often eat more than their own bulk in a few hours. It was clear at last that the lady would not tolerate this persistent interference with her dinner ; for when, after waiting rather a longer time than usual closed up in her tube, she once more expanded, only to find him once more in his old position, she lost all patience, and effectually put an end to his absurdities by giving one monstrous gulp and swallowing her lover. It will not surprise you to hear that he did not agree with her, and that after a short time she gave up all hope of digesting her mate, and shot him out into the open again, along with the entire contents of her crop. He fell a shapeless, motionless lump ; the two score and ten minutes' love of a male Rotifer's life cut short to five ; but strange to say, in a second or two, first one or two cilia gave a flicker, then a dozen ; then its body began to unwrinkle and to plump up ; and at last the whole corona gave a gay whirl, and the male shot off as vigorous as ever, but no doubt thoroughly cured of its first attachment.

THE AMERICAN MOLLUSCA.—Although the North American shells have been so carefully studied for many years, new species are still turning up. Mr. W. G. Binney sent me recently a fine new *Zonites* or *Hyalina*, found in North Carolina. This species, which I shall call *Z. Carolinenses*, is allied to *Z. sculptilio*, but differs in its fewer whorls, its straighter columellar margin, its fewer sculptured lines, and its less lunar aperture. Fig. 231 in Binney's "Man. Am. Land Shells" is *Carolinensis*, and not *sculptilis*, as there stated. Another interesting new species is *Prophysaon cæruleum*, from Olympia, Washington ; a slug with the body and mantle clear blue-grey, the sides paler, and the sole white. The reticulations are simpler than in any other species of its genus. The "*Arion*" *foliolatus* of Gould has been rediscovered by Mr. Hemphill (who also found *P. cæruleum*), and proves to belong to a new subgenus of *Prophysaon*, called *Phenacarion*. To those conchologists whose interests are not limited by the shores of the British Isles, North American shells offer a wide field for interesting research, with the advantage of excellent works on the subject in the English tongue. One already notes with pleasure how much correspondence there is between English and American conchologists, and for not a little of this we have to thank our old friend SCIENCE-GOSSIP.—*T. D. A. Cockerell.*

BIRDS' EGG CURIOSITIES.—With reference to the article on "Birds' Egg Curiosities," in the January number, it may be of interest to some of your readers

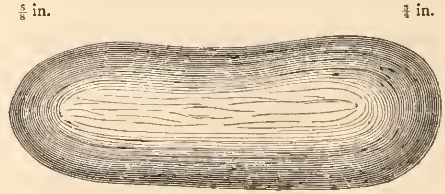


Fig. 72.—Egg of Gallus. $2\frac{1}{4}$ in. long.

to know that I have in my collection the egg of a domestic fowl, *Gallus gallus*, Lin., erroneously often named *G. bankhiva*, Temon—of what variety I do not know, measuring two and a quarter inches long by three-quarters at the thick end and five-eighths at the thin end. It was the hen's last egg, and was, I think, laid in 1886 or 1887. I blew it myself, and it was remarkable from its having hardly any yolk, and what it had being very light-coloured. I should like to know if such eggs are common, as I don't remember to have seen such a one before. The colour is a dull creamy yellow with a tinge of brown. Enclosing a rough life-size sketch of the egg.—"*Egg.*"

BUTTERFLY'S EGGS, ETC.—At the last meeting of the Entomological Society, Mr. W. L. Distant exhibited, on behalf of Mr. Lionel de Nicéville, a branch of a walnut-tree on which was a mass of eggs laid by a butterfly belonging to the Lycænidæ. He also exhibited two specimens of this butterfly which Mr. de Nicéville had referred to a new genus and described as *Chætoprocta odata*. The species was said to occur only in the mountainous districts of North-West India, at elevations of 5000 to 10,000 feet above the sea-level. At the same meeting, Capt. Elwes read a letter from Mr. Doherty, in which the writer described his experiences in collecting insects in the Naga Hills by means of light and sugar. Mr. Doherty expressed an opinion that light, if used in very out-of-the-way places, rather repelled than attracted insects; in fact, that they required to be accustomed to it, and that the same remarks applied to sugar. Mr. F. Merrifield read a paper entitled "Systematic Temperature Experiments on Some Lepidoptera in all their stages," and exhibited a number of specimens in illustration of his paper. The author stated that the darkness of colour and the markings in *Ennomos autumnaria* resulted from the pupæ being subjected to a very low temperature. In the case of *Selenia illustraria*, exposing the pupæ to a low temperature has not only affected the colour of the imagos, but had altered the markings in a striking manner. Lord Walsingham observed that it appeared that exposure to cold in the pupa state produced a darker colouring in the imago, and that forcing in that stage had an opposite effect; that insects subjected to glacial conditions probably derived some advantage from the development of dark or suffused colouring, and that this advantage was, in all probability, the more rapid absorption of heat. He said he believed that an hereditary tendency in favour of the darker forms was established under glacial conditions, and that this would account for the prevalence of melanic forms in northern latitudes and at high elevations. Capt. Elwes, Mr. Jenner Weir, Dr. Sharp, and others continued the discussion.—*H. Goss, & W. W. Fowler, Hon. Secs.*

WESTERN SLUGS.—Mr. H. F. Wickhand recently sent me a number of slugs in alcohol, from the Pacific slope of America, some of them of great interest. The familiar *Limax agrestis* is extending its range, and turns up in force at Portland, Oregon. *Amalia hewstoni* comes from Cœur d'Alene, Idaho, and from these, and especially larger Californian examples received from Mr. W. G. Binney, it appears that, without doubt, this is nothing but our old friend *Amalia gagates*, under a different name. Two species are new; one, *Prophysaon humile*, n. sp., from Cœur d'Alene, has a striate but ribless jaw, though in some respects close to *P. Andersoni*. It has distinct bands on the back. The other, *Prophysaon pacificum*, n. sp., is a small ochery-brown slug, with a black band on each side of the mantle. It is from Victoria, Vancouver I., and might be suspected to be the young of the lost species "*Arion*" *foliolatus* of Gould, but that it differs in the want of a mucus pore, in its reticulations on body, &c. Its jaw is prominently ribbed. Descriptions and figures will shortly be published of the new species.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

VARIATION IN THE MOLLUSCA.—Perhaps I need hardly reply at all to Mr. Williams's remarks on p. 42, partly because I have already published about all I have at present to say on the subject, and partly because it is not very useful to dispute on pure matters of opinion. But a word, nevertheless, on *Limnæa stagnalis* var. *fragilis*. The main point about this variety is its narrow tapering spire, with a compressed body-whorl—and these characters are not given for *pumila*. The var. *fragilis*, as now understood, approximates to some of the North American forms of the species. The same tendency occurs in examples found in the Thames near Barnes—where, however, I have only discovered dead shells. Moquin's *pumila* is probably near to both *fragilis* and *speciosa*, but until we get evidence that it is the same it should have the benefit of the doubt.—*T. D. A. Cockerell, West Cliff, Custer co., Colorado.*

RARE FISH.—Mr. J. B. Beckett, of Great Yarmouth, dating February 25th, writes to us as follows: "Whilst walking along our beach at noon last Sunday, I found, between the Jetty and the Britannia Pier, washed up on a clean tide mark, a few yards from each other, three specimens of what at first sight appeared to be young herrings. Minuter inspection, however, showed them to be something out of the ordinary run, so I took them home and rummaged through the books I have at my disposal, but could find nothing to answer their description. On Monday I showed them to Mr. A. Patterson, and he, after carefully examining them, thought they were the rare Müller's Scopelus (*Maurolicies pennantii*), but, not being sure, I forwarded two of them to T. Southwell, Esq., F.Z.S., of Norwich, and that gentleman has confirmed Mr. Patterson's opinion. Muller's Scopelus is a small deep-water fish, and only once before has its capture been recorded on the whole east coast of England, one specimen being found by Mr. Patterson near the harbour's mouth in March last. Thomas Edwards, the Scotch naturalist, found several off the coast of Banff, and no doubt it is less rare than is supposed, but being so small is easily overlooked." Dr. Day says: "They are generally found thrown up on the shore after bad weather, and doubtless the continual east winds and rough weather we have lately had accounts for them coming into my possession."

Zootica Vivipara.—It seems marvellous that a cold-blooded animal like this lizard should bring forth its young alive, but I believe the explanation of the phenomenon to be as follows: *Zootica vivipara* is extremely fond of basking in the sun, and it will lie for hours on the hot sands unless disturbed. The females when they are full of eggs are especially prone to this, and I think it highly probable they do this instinctively, and instead of burying their eggs in a dunghill, as the viper does, incubate them themselves (if the expression may be permitted) by lying in the hot sunshine in the manner just described.—*Albert H. Waters, B.A., Cambridge.*

"Pond-life in the Parks."—It would be interesting if E. H. W., who writes from Birmingham, would give some details concerning some of the species in his list of Rotifera. Two of them, *Distemma forficula* and *Rattulus lunarisi*, appear to be new to Britain, unless, indeed, as it seems difficult not to suspect, the latter is identical with Gosse's *Cœlopus porcellus* (see "The Rotifera," vol. ii. p. 67). The only habitat assigned to the former in Dr. Hudson's supplement is "Near Berlin" (p. 31). It seems doubtful whether *Monura dulcis* has been found in England before; Gosse mentions ("The Rotifera," vol. ii. p. 110) specimens of what he supposed to be this species, sent him by Mr. Lord; but the only habitats given at p. 47 of the Supplement are "Near Berlin; possibly Cattaro." *Ptygura melicerta* is assigned by Dr. Hudson to the genus Œcistes, under the name of *Œc. ptygura*. *Brachimus amphiceros* is considered by the same authority as a variety of *B. pala*. The Tardigrada are not generally included among the Rotifera, nor has Chœtonotus a place in Hudson and Gosse's work.—*J. W. Blagg.*

BOTANY.

Vegetable Teratology. — The following "sports" may be of interest: (1) *Inula dysenterica*, in which the same peduncle bore two distinct flower-heads pressed close together back to back. (2) A double cherry, i.e., two pedicels joined together to within $\frac{1}{8}$ inch of the top, each bearing a fruit. (3) *Bellis perennis*, in which the involucral bracts were so large that they looked like a cluster of small leaves; this was found in mid-winter. (4) *Plantago lanceolata*, in which each peduncle bore, instead of a simple spike, a whole plant in miniature, leaves included. In Jersey I have often seen this plantain bearing clusters of spikelets, instead of solitary spikes. Is this a common form?—*J. E. C.*

The Botany of Sutherland.—I was not very surprised on reading Mr. Bennett's remarks (p. 44) relative to my paper on Sutherland in the last September number. The fact is that the floral features of north-west Scotland are rather puzzling both as regards the peculiar aspects of certain species of plants, and also the life-zones wherein they are found. Recognising these difficulties, I actually did, prospectively as it were, take the advice of Mr. Bennett, and gave myself considerable trouble in consulting Watson and other authorities in order to verify as far as possible the rather surprising "finds" which I personally noted on the spot. Moreover, I observed one particularly conspicuous flowering plant, totally new to me, of which, after turning over nearly the whole of Sowerby, I cannot say that I know the name. However, to discuss particulars, it may be admitted that the *R. lingua* may have been a large variety of *R. flammula*, that *Orchis morio* may have been mistaken for another species (although it was uncommonly like some I had recently seen from Surrey), that *Pinguicula Scotica* is a slip for *Primula Scotica*, and that *Salsola maritima* may be termed *S. Kali*. On the other hand, that I actually did see *Geranium pusillum* and *Linum angustifolium* I have not the shadow of a doubt, but both were probably aliens, the former appeared as if an offshoot from a garden. *Galium mollugo*, as far as I remember, was observed in or near a wood—a very rare thing in Sutherland, and, as to *Valeriana dioica*, the plant seen was the plant known to me by that name. I have not got by me just now the notes referred to, so that I cannot perhaps do full justice to the subject; but I may add that the "collecting" of plants, rare or common, save for direct and immediate personal research, has never been my practice, and, as respects other individuals, has always been a subject for expostulation.—*P. Q. Kegan.*

A New British Plant.—Mr. Charles Bailey, F.L.S., sends us a copy of his paper reprinted from the "Memoirs and Proceedings of the Manchester Literary and Philosophical Society," on "*Arenaria Gothica* as a Plant New to Britain." The specimens of plant were found by Mr. Bailey, at Ribbleshead, Yorkshire. The find is all the more interesting, in that the plant had hitherto been restricted to two Swedish localities.

New British Algæ.—At the meeting of the Linnæan Society of London, December 5th, 1889, Mr. E. M. Holmes exhibited, as a new British marine alga, a specimen of *Gracilaria divergens*, a rare native of the warmer portions of the Atlantic and the Mediterranean, which had been recently found at Brighton by Mr. J. Miles. The specimen exhibited possessed tetrasporic and cystocarpic fruits not described by Agarth.

Destruction of Rare Plants.—In the last number of Science-Gossip there is a very interesting article on rare plants, and their becoming more rare in consequence of being so much hunted after and rooted up. *Primula farinosa* is very plentiful in Teesdale, and I think that it will never be exterminated there. It is a very pretty sight when in full bloom, as it gives quite a pink tinge to the fields, with here and there a bit of bright blue from *Gentiana verna*. In Weardale I only know of two localities where it can be found; one I have seen myself many times, the other I have seen the blooms from it. I have often been asked where these localities are, but I keep the information to myself, although I have no objections to get a few roots for any one who really cares for the plant. Many years ago it used to grow on a bog between here and Durham, but now there is a coal pit on the place. There was a rather peculiar instance of a plant coming and going here. When our parish church was rebuilt in 1848 the soil from the foundations was spread on one particular part of the churchyard, and for a few years Henbane was to be found there, and then it quietly died away. The plant was not known here either before or since; I have kept a look-out for it whenever a grave has been dug, but have never seen it since.—*A. Pickard, Wolsingham, Durham.*

GEOLOGY, &c.

A Huge Fossil Plant.—The largest plant-fossil in Europe is at present being exhibited at the Berlin Berg-Akademie. It was discovered in 1884 in the coal mines of Piesberg, and sent to Berlin by the chief magistrate of Osnabrück. With great difficulty the huge mass was cut out of the earth in which it was embedded and carted away. The fossil is a piece of a gigantic ancestor of the ordinary Lycopodium of the present day, known as Sigillaria. It consists of a trunk about one yard in diameter, which divides at the bottom into several forklike strong roots, rung horizontally. The surface of the trunk looks like wood, and shows a graining in the form of long ridges. The bark is still traceable in places, in charred-looking remains. Many of the roots show the marks where formerly grew the long cylindrical suckers which supplied the plant during its lifetime with nourishment. The entire fossil, with the exception of the charred pieces of bark that remain, consists of argillite. The process of fossilisation was as follows:—The trunk and roots became embedded in mud, which gradually hardened; the trunk then rotted away, so that at last only the hard case round it remained, which was then tubelike in form; this tube became gradually filled with argilaceous mud, which in its turn hardened, and took the shape of the trunk.

NOTES AND QUERIES.

Cuckoo and Wagtail.—Mr. Smith, in December number of Science-Gossip, asks, "Is it not strange that the pied wagtail should be foster-mother to the cuckoo?" It is not uncommon. Last year I saw a wagtail whose whole time, like the one Mr. Smith refers to, seemed to be taken up in catching flies for a young cuckoo. It was busy as a bee. Some years ago I saw a young cuckoo in a wagtail's nest, in a quarry at Chipping Sodbury. I also remember when a lad one being found in a robin's nest, with the young robins outside. I do not think the cuckoo is partial to any particular nest, such as the hedge-sparrow, which Mr. Smith suggests, so that she can rid herself of the responsibility of rearing her offspring. Is it not strange (1) That she should lay so late in the season, as in the case Mr. Smith refers to? (2) That small birds should so seem to lack discrimination as not to object very strongly, but rather to take to, and feed so assiduously one so much larger than their own young, and even than themselves; and (3) That the cuckoo should lay her eggs in the nests of small birds, and thus impose the responsibility of rearing her young upon those whose own family claims are so heavy and constant, instead of laying, say, in a crow's or magpie's, or other large bird's nest? But perhaps she does, although never to my knowledge. Has any reader of Science-Gossip ever known of such a case?—*J. Brown, Wincanton.*

Colour of Eggs.—I am told that a certain guillemot near Flamboro' invariably lays white eggs. The collectors usually obtain three or four eggs every season from the same ledge, and I believe they are sold at a high price to a collector in the south, who has a standing order for all they can procure.—*J. A. Wheldon, Leeds.*

Tadpoles.—With reference to a correspondence in the last volume as to tadpoles remaining for an abnormal length of time previous to metamorphosis into frogs or toads as the case may be, I may mention that in 1871 I found in the pools of a quarry about two miles from my present residence a few black tadpoles, presumably those of the toad, so late as November 8th. Some of these, however, had acquired legs, but the majority were entirely destitute of these useful appendages. I had an idea at the time that these tadpoles were those of the Natterjack (*B. calamita*). Last year, too, I noticed tadpoles in the same quarry in the second week in October.—*W. H. Warner, Fyfield, Abingdon.*

Bird-Egg Curiosities (p. 7.)—Might I add two or three more "curiosities" to those enumerated by Mr. T. D. Wright, in his interesting article under the above heading? I once had an egg of the hedge-sparrow (*A. modularis*), which, though similar in colour and shape to those usually laid by that familiar little bird, was in size no bigger than those deposited by Jenny Wren in her "hole of a nest." Again, in July 1883, I found the nest of a spotted flycatcher (*M. grisola*) built in the fork of a pear-tree in an orchard in Oxfordshire, containing four eggs, which, instead of being of the usual bluish-white tint, liberally freckled with faint red, were of a uniform pale greenish-blue, and, more singular still, were almost globular in form. Our breakfast-table purveyor too (*Gallus domesticus*) often produces some remarkable curiosities in the shape of eggs. A neighbour one morning showed me an egg which had been laid by one of his fowls. It was in size and shape very similar to that of the common snake (*T. natrix*), and was buff in colour, sprinkled with reddish spots.—*W. H. Warner, Fyfield, Abingdon.*

The Common Guillemot.—Any one who has a long series of eggs of this bird, or who has an opportunity of seeing a number of eggs of this bird, will at once be struck by the great diversity of colouring and markings there is in these eggs. Some we have almost white and spotless, or nearly so, others with cream grounds, and again others with green grounds, spotted and fantastically streaked and blotched. In looking over eggs of this bird I have often been struck with the thought, what is the reason of this great diversity of markings, etc.? Is it because some birds have the power of secreting a certain colour more developed than others have, or is it because there is a tendency to vary in the birds themselves? Speaking of the guillemot, Mr. Darwin says ("Origin of Species," p. 72): "Graba estimates that about one-fifth of the guillemots in the Faroe Islands consist of a variety so well marked that it was formerly ranked as a distinct species under the name of *Uria lacrymans*." Assuming that we have the same tendency to vary in other localities also, would this variation have a tendency to alter the colour of the eggs, or what is the reason of so much variation in the eggs of this bird? My reason in introducing this subject is merely to obtain if possible a little more information about this bird. Not being near the sea-coast, I have not the same opportunity of observing these birds as those who live on the coast. Will those of your readers who have carefully observed this bird give us the benefit of their observations, so that we inland folks may get a better idea of the probable causes of variation?—*F. W. Paple, Bolton.*

THE NEBULAR HYPOTHESIS.—A reader of SCIENCE-GOSSIP who has followed the series of articles by E. P. Ridley on the "Nebular Hypothesis" with great interest—if imperfect comprehension—would esteem it a favour if the writer, or other astronomical correspondent, would supply an answer to the following question:—"The moon," the last article states (SCIENCE-GOSSIP, p. 49, March), "appears to afford an example of the universal death which, in a remote future, awaits all the members of the solar system." Granted the perfect truth of this statement. But, if the moon at one time possessed an aqueous belt, with water on the surface like our own planet, how did the laws of gravity and attraction permit the same to disappear?

HAWFINCHES.—Two hawfinches were shot by a farmer of this parish on January 15th in his garden. I don't know whether this is worth taking a note of. No one had seen one before here, so they must be rare in this neighbourhood. I don't think they would have been shot if it had been known they were not as mischievous as bullfinches.—*R. Abbay, Earl-Soham.*

THE STING OF THE ADDER.—I venture to add a few remarks to those of your correspondent on the sting of an adder. Not long ago I had the misfortune to be bitten by one when attempting to capture it alive. I immediately sucked the wound vigorously, but beyond that I took no other remedial measures. The symptoms were exactly those of a severe bee sting. The swelling commencing at the wound in my finger, rapidly extended up the arm as far as the shoulder, but no farther, the skin of the arm and hand being distended to the utmost and remaining so for two or three days, at the end of which time it changed to a yellowish green colour, and then the swelling gradually subsided, leaving no ulterior effects. I may here mention that the viper, so far from being disturbed by this little incident, appeared at the same spot the following morning, and now adorns my "curiosity shop." There is not the slightest doubt that the effects of an adder's bite depend entirely on the condition of the blood of the individual or animal bitten. I know of two dogs who have entirely recovered from the effects of adder bites. And I have no doubt that those persons who are severely effected by bee's stings would succumb in a very short time to the bite of an adder. The adder is naturally very shy, but when about to shed its skin its sight is impaired and its movements are then comparatively sluggish, and I think that it is generally under these circumstances dogs are bitten. The short tailed field-mouse is the viper's principal food. The one by which I was bitten (a large one) contained three of these in various stages of digestion. At one time I had several young vipers, and was at a loss to know what to feed them on until I tried young frogs, just changed from the tadpole stage, which were swallowed voraciously, three or four being taken at one meal. By the bye, is it correct that adders are fond of the water? In this district they are always found in dry places on the hills, and I have never heard of one taking to water. I am strongly of opinion that the idea of vipers allowing their young to wriggle down their throats when in danger, is erroneous. The rustics about here all believe the theory, but I find that they have generally formed their opinion from the fact that they have at one time killed vipers containing eggs, and at another time containing young, not knowing that the viper is ovo-viviparous.—*Edward Goodwin.*

MONSTROSITY OF HYACINTH.—After seeing Mr. Perrett's note upon this subject, I examined some hyacinths I had, and found one similar to the flower he mentioned. Also, upon asking a friend who had a number of hyacinths if he had noticed anything like it, he brought me three abnormal flowers, each from a different plant. Of these, two had thirteen segments to the perianth, fourteen stamens, and two perfect ovaries each; while the third consisted of two normal flowers upon one pedicel, attached to each other throughout their length. These flowers were from single hyacinths. I have frequently seen cases of these monstrosities, but never remember having seen them reproduced by the same bulb the following year.—*Geo. Parish, Oxford.*

VANDAL NATURALISTS AND PILFERERS.—Mr. Blagg's careful experiments in removing eggs strengthen rather than weaken my argument, for, had he not substituted some extraneous substance for the eggs taken, the birds would, in all probability, have forsaken their nests. Pilferers, I regret, do not take that trouble, neither do they "carefully coax the birds off their nests." I beg to inform Mr. Blagg that, for many years, I was a large keeper of all kinds of poultry, and I consider that "pumping a pigeon" has no more bearing on the case than the very free handling of the proverbial cow's tail. Birds in their wild state and those receiving domestic treatment live under two quite different conditions; but if Mr. Blagg's theory will hold water, i.e., that by clutch-collecting the birds will soon become barren, the common sparrow (*Passer domesticus*), whose eggs have been most systematically taken for a great number of years, should, by this, time, have become quite extinct: nevertheless, the cry is, We have far too many sparrows.

ACCIDENTS TO BIRDS.—Reading Mr. Litt's account of a fatal accident to a sparrow in the March number recalls to my mind three interesting cases which came under my notice a few years ago. A long-tailed tit had nearly completed its dome-shaped nest, when by some means, its tail getting entangled with the moss of its nest, it had hung suspended, and in its efforts to free itself the feathers of its tail and the loose pieces of moss had become twisted into a stringlike form. It was quite dead when I found it. The two other cases, which might have proved fatal had the birds not been extricated, were those of a robin having hooked the fleshy part of its foot on the thorn of a rose tree. The other, that of a sparrow which had got its leg fixed in the small fork of a fir branch. Both of the birds when rescued were fluttering in a suspended position.—*J. C. Smith, Penrith.*

Notes on Fruit Trees.—May I add to Mrs. Mary B. Morris's interesting notes on fruit trees (*vide* p. 80, first column) that as an Oxford, though not a New College man, I have long understood that the timber in the roofing of the beautiful cloisters of New College, Oxford, commonly supposed to be oak, is really chestnut. If I am wrong here, perhaps some Fellow of the college will kindly set us right on the point. Or are oak and chestnut both used there? The two woods, especially when aged, are often confused, as sometimes are English and American oak, though of course the latter, growing more rapidly, has a coarser grain.—*W. H. Hollings.*

Pugnacity of the Greenfinch.—I have a greenfinch in my aviary of a very bold and audacious disposition. A thrush in the same aviary is a great tyrant over the same birds, and persecutes them a good deal. Generally they act on the principle that discretion is the better part of valour, and get out of his way; but the greenfinch boldly faces the bigger bird with his beak menacingly open, and the bully is soon cowed into beating a retreat.—*Albert H. Waters.*

Notes on Fruit Trees.—I beg to be allowed to point out a mistake in the paper about the chestnut tree, by Mary B. Morris, in the last number of Science-Gossip. The marronnier of the Jardin des Tuileries is not *Castanea vesca*, but *Æsculus hippocastanum*, in French *Marronnier d'Inde*, and its date of foliation is usually known in Paris, not first but twentieth of March. Even the tree-giving marrons are called in French *Châtaigniers.*—*C. C., Doullens, Saumur.*

Early Flowers.—The plants were found, except where otherwise notified, in the neighbourhood of Reigate, Surrey. Jan. 8, buttercup (*R. bulbosus*), Edenbridge, Kent; Jan. 10, hazel, male and female flowers, Edenbridge, Kent; Jan. 11, primrose, Edenbridge, Kent; Jan. 12, violet (*V. odorata*)—barren strawberry; Jan. 13, creeping crowfoot (*R. repens*), Edenbridge, Kent; Jan. 19, coltsfoot—dog's mercury; Jan. 21, spurge laurel; Jan. 27, common elm; Feb. 1, ivy-leaved speedwell; Feb. 6, lesser celandine, Edenbridge, Kent; Feb. 8, alder; Feb. 10, white poplar; Feb. 16, whitlow-grass; Feb. 17, cuckoo flower, Edenbridge, Kent; Feb. 18, golden saxifrage (*Chry. oppositifolium*), Edenbridge, Kent; Feb. 22, sallow, Sussex; Feb. 23, snowdrop (naturalised by the river); Feb. 25, ground ivy, Edenbridge, Kent; March 8, winter-cress (*Barbarea vulgaris*), Edenbridge, Kent; March 9, yew; March 15, violet (*V. hirta*); March 21, wood rush (*Luzula pilosa*), Edenbridge, Kent; March 23, anemone; March 27, moschatell; March 28, marigold—thale-cress; March 29, goldilocks (*R. auricomus*), wood spurge, and daffodil, Edenbridge, Kent; April 2, hyacinth, Edenbridge, Kent; April 4, bitter-vetch (*Lathyrus tuberosus*), Sussex; April 5, wood-sorrel—germander speedwell—water crowfoot (*R. Lenormandi*), Sussex. —*E. S. Salmon.*

Seasonable Notes.—Feb. 3, *Chrysosplenium oppositifolium* in flower; Feb. 8, ribes in flower—skylarks singing; Feb. 10, daffodil in flower; Feb. 18, jackdaws building; Feb. 25, wren building; March 5, *Hieracium pilosella* in flower; March 11, willow in flower; March 13, sycamore bursting into leaf—bumble-bee seen; March 14, *Oxalis acetosella* in flower—horse-chestnut and laurel bursting into leaf; March 15, may-flower (*Caltha palustris*) in flower; March 23, small white butterfly seen; March 25, *Viola canina* in flower; March 26, blackthorn in flower; March 27, wild anemone in flower; March 27, gooseberry in flower; March 31, willow wren seen.—*Rev. S. A. Brenan, Cushendun, co. Antrim.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

W. D. R.—It is not uncommon to find the butterflies you mention out on warm days towards the end of March. They are generally individuals which have been hybernating.

R. M. P.—The sons of the late Mr. Thomas Bolton are still carrying on their father's business, and are supplying living microscopical material. We are not aware if the "Portfolio" of microscopical drawings of animals and plants is still issued.

M. C.—The green primroses you sent are very interesting, although not uncommon. It is due to the petals secreting chlorophyll, after the manner of ordinary leaves.

Hulwidgeon.—Kindly send us your name and address.

Insecta.—To be a Fellow of the Entomological Society you must be proposed by at least one Fellow who knows you personally, and two others from general knowledge of you as an entomologist.

T. S.—Are you sure you are right in the spelling of the words? Some of your terms are new to me. *Ypresien* consists of a great series of clays and sands answering generally to the London clay, but not represented in France. *Bartonien* corresponds with the Barton clay, the highest division of the eocene strata of England. In what manual did you find the other terms?

S. S. F. B.—Get Cooke's "Ponds and Ditches," price 2*s.* 6*d.*, published by S.P.C.K. A little fishing on your own account will soon make you familiar with likely pools. You will find "The Playtime Naturalist" handy (Chatto, price 5*s.*), on account of its illustrations.

EXCHANGES.

Wanted, to exchange European plants for N. American, S. American or Australian plants.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

Specimen of cardboard tray for birds' eggs, shells, minerals, fossils, &c., sold by the Naturalists' Publishing Company, 112 Rann Street, Birmingham.

Wanted, magic-lantern slides—plain preferred—of Scripture views, "Holy War," also Science-Gossip, 1869 and 1879. Offered, micro-slides of insects and parts of insects, mosses, hepatica, &c., &c.—W. E. Green, 24 Triangle, Bristol.

Wanted, journals (parts or otherwise) of the Royal Historical and Archæological Society of Ireland, in exchange for Science-Gossip, several years unbound, or Irish antiquarian photos.—R. Welch, 49 Londale Street, Belfast.

Wanted, the following books in good condition: Davis's "Biology," Lloyd Morgan's "Animal Biology," and Bower and Vine's "Practical Botany."—H. W. Parritt, 103 Camden Street, London, N.W.

H. limbata, meda, strigosa, fortunata, Maderensis, &c., in exchange for European and exotic land shells. Lists exchanged.—Col. Parry, 18 Clyde Gardens, Eastbourne.

OFFERED, "English Illustrated Magazine," "Cornhill Magazine," SCIENCE-GOSSIP, unbound, good condition, 1886, 1887, 1888, 1889, together or separately. What offers? Mounted micro-slides or flower roots preferred.—Miss P., Fern Cottage, Witheridge, North Devon

WILL exchange lias and gault ammonites and belemnites for good teeth from red crag, or for galerites and other echini from chalk.—Charles Wardingley, Blackwood Crescent, Edinburgh.

WANTED, mounted micro-objects in exchange for 22 copies of SCIENCE-GOSSIP, 1888–9.—A. J. Blakey, Lighpill, Stroud.

WANTED, continental and foreign hydrobiæ in exchange for British hydrobiæ and land and freshwater shells.—A. J. Jenkins, 6 Douglas Terrace, Douglas Street, Deptford, S.E.

A SMALL collection of minerals in case, offered in exchange for fossils, or foreign shells.—Thomas W. Reader, 171 Hemingford Road, Barnsbury, London, N.

WILL exchange tubes of *Melicerta ringens*, for tube of *Stephanoceros floscularia* or *nata, cornuta*, or *Lemna trisulca*, *Utricularia*.—J. W. Measures, Cobden House, Todmorden.

WANTED, fossil shells, or named foraminifera in exchange for *H. aspersa, nemoralis, virgata, rufescens, rotundatus, cantiana, Clausilia rugosa, Limnæa peregra, Cypræa Europæa, &c.*—Chas. Pannell, Jun., East Street, Haslemere.

DUPLICATES.—*Pecten fumatus, Cardium tenuicostatum, Lima bullata, Fasciolaria fusiformis*, and many others. Desiderata, other exotic species—not in collection—lists exchanged.—W. J. Jones, Junior, 27 Mayton Street, Holloway, London.

OFFERED, *Runcina Hancocki.* Wanted nudibranchs or any others of the scarce British marine mollusca.—E. R. Sykes, 9 Belvedere, Weymouth.

OFFERED, Rowland Ward & Co.'s "Naturalists' Camera," in walnut case, complete, nearly new.—Rev. J. J. Merry, Rolleston Vicarage, Newark.

IN exchange for *Sphærium corneum* and *Pisidium nitidum; Unio pictorum, Clausilia laminata, Valvata cristata, Ancylus fluviatilis, H. fusca, H. sericea, H. caperata.*—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

PRACTICAL CHEMISTRY (London Intermediate; Science and Art, advd.) The whole of the apparatus, reagents, &c. for these exams. for exchange. Wanted, Edwards' "Differential Calculus," De Bary's "Comparative Morphology of Fungi," &c., Vines' "Physiology of Plants," Goebel's "Outlines of Morphology and Classification," or other kindred works.—C. A. Whatmore, B. Sc. (Int.), Much Marcle, Gloucester.

WANTED good foreign postage stamps—will give books, shells, micro-slides in exchange.—A. Alletsee, 1 South Villas, Kensington Road, Redland, Bristol.

WANTED a good binocular microscope stand with 1 inch, ¼ inch, and ⅛ inch objectives, and other necessary apparatus. Must be by first-class maker.—J. H. C., Ashfield House, Sliema, Malta.

WANTED: Carpenter's "Introduction to the Study of the Foraminifera," De Orbigny's works on foraminifera, especially "Foraminifera of the Vienna Basin," and any other works on the foraminifera.—J. H. C., Ashfield House, Sliema, Malta.

WHAT offers in exchange for a box containing 100 varieties of British marine shells, all named, first-class shells, some rare.—Alfred J. Sclater, M.C.S., Bank Street, Teignmouth, Devonshire.

GEOLOGY, for disposal some finely cut and polished geological cabinet specimens of rare Devonian (Madrepore) corals and sponges, from trias rocks. Teignmouth and the neighbourhood, all sent correctly named and localised. The following are a few of the names of them. *Stromatopora polymorpha, S. concentrica, S. digitatum, Amphipora ramosa, Smithia Bowerbanki, S. Pengellyi, Acervularia limitata, Cyathophyllum hexagonum, Hallia Pengellyi, Heliolites perosa, Acervularia pentagona, Favosites cervicornis* (feather madrepore), *F. fibrosa, Alveolites suborbicularis, Millipora allcicornis.* Offers requested.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

WANTED, *U. margaritifer, P. carinatus, L. stagnalis, trunctula; H. pomatea, Pisana, pulchella; B. montanus, C. minimum, &c.*, in exchange for other shells, lepidoptera, or foreign stamps.—Mrs. Smith, Monmouth House, Monmouth Street, Topsham, S. Devon.

PARTS 217 to 228, and 265 to 283 of SCIENCE-GOSSIP. Offers requested in exchange.—C. Lord, 34 Burlington Crescent, Goole.

NESTS, or notes of nests of British wild bees required for study. State what wanted in exchange, but kindly write particulars first.—H. A. Francis, F.R.M.S., 14 York Place, Clifton, Bristol.

WANTED, Lubbock's "Origin of Civilisation," "Pre-historic Times," and Herschel's "Outlines of Astronomy."—Arthur Pearson, Milnrow, near Rochdale.

EOCENE fossils from Barton Clay over 100 named species, also deposit from Highcliff and Headon, containing foramen and entomostraca, &c. Foreign shells or curios wanted or electrical apparatus in exchange.—E. H. V. Davies, San Remo, Darracot Road, Pokesdown, Bournemouth.

WANTED, minute micro-photos, also foreign shells, butterflies, or anything interesting. Exchange choice micro-slides botanical, anatomical, diatoms, parasites, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

DUPLICATES of *Vanessa polychloros, L. potatoria, P. chysitis, Cucullia verbasci, Argynnis adippe, Papilio machaon, Anthocharis cardamines.* Offers wanted in exchange.—H. Cole, 6 Castle Meadow, Norwich.

OFFERED in exchange for microscope, &c., choice fossils from the following formations: upper lias, oolites, neocomean, chalk, British and foreign tertiaries.—W. D. Carr, Lincoln.

OFFERED, Huxley and Martin's "Practical Biology;" "Complete Works of Pliny," Holland's edition (1634) perfect; "Life," P. H. Gosse; "Flowers and Pedigrees," G. Allen; "Half-Hours with the Microscope," Davis; "Practical Microscopy," Davis: Goldsmith's "Animated Nature." Also diatomite from Loch Kinnord deposit, a collection of 400 different foreign stamps. Also "Preparation and Mounting of Micro-Objects," Davis. Wanted, "Hobkirk's British Mosses," or other exchange.—H. Wallace, West Clepington House, Dundee, N.B.

DUPLICATES.—Lepidoptera; sun starfish (3), spider-crabs, land and freshwater and marine shells. Wanted many species of British shells, exchange lists.—W. T. Pearce, 111 High Street, Gosport, Hants.

WANTED, living or fresh aurelia, uraster, patella, in spirit. Scorpio, tropical centipedes and millipedes, lepas. Also specimens of millepora, stylaster, furgia, dendrophyllia, galerites, spirula, and limulus. Shells, or other good exchange.—Wilfred Mark Webb, 31 Aynhoe Road, West Kensington, W.

WANTED, batches of living helices, especially *aspersa, nemoralis, hortensis*, and larger species, in exchange for land and freshwater shells.—Wilfred Mark Webb, 31 Aynhoe Road, West Kensington, W.

OFFERED, rare British land and freshwater shells. Wanted, *Pisidium roseum* and foreign clausilias.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorks.

JOHNSON'S "Introduction to Conchology," and Heyworth's "Book of the Lantern," in exchange for books on microscopy, micro lamp, or offers.—G. Barker, 24 Avenue Villas, Cricklewood, N.W.

WANTED, correctly named spines of echinodermata for sectionising, spines of *Cidaris hystrix* and *gardelia* particularly required. Mounted sections of spines in exchange.—A. B. Hoskings, Ventnor Cottage, College Park, Lewisham.

WANTED, L. C., 8th ed.: 20, 29*b*, 35*b*, 38, 425–431, 435, 436, 440, 446, 448–452, 454, 457, 458, 460–464*b*, 467, 469, 473*b*, vars. of 474, 484, 838–840, 842–850, vars. of 851, 854–858, vars. of 859 and 860, 861, 862, vars. of 863, 867, 868, 870, several vars. of mentha. Named vars. of British ferns, especially 1790*b*, *c*, *d*, 1793*b*, *c*, *d*, *e*, 1798 vars., 1799 vars., 1801*b*. Rare plants in return, including a few hieracia and uncommon casuals.—J. A. Wheldon, 4 Rosebank Road, Leeds.

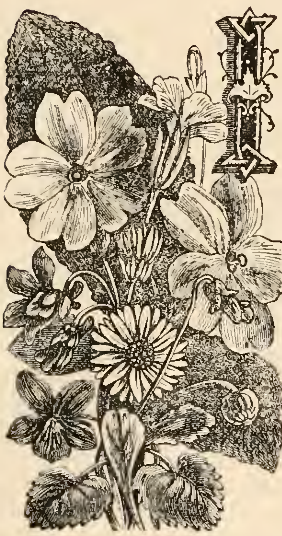
BOOKS, ETC., RECEIVED.

"The Country Roads of England," by Urban Smith.—"Proceedings of the Literary and Philosophical Society of Liverpool" (vols. xli., xlii., and xliii.).—"Days and Hours in a Garden," by E. V. B., seventh edition (London: Elliot Stock).—"The Flowering Plant: as Illustrating the First Principles of Botany," by J. R. A. Davis (London: Chas. Griffen).—"The Root-Knot Disease of the Peach, Orange, and other Plants in Florida, due to the work of Anguilula," by J. C. Neal (U.S. Department of Agriculture).—"Report of a Trip to Australia to Investigate the Natural Enemies of the Fluted Scale," by A. Koeble (U.S. Department of Agriculture).—"The School Manual of Geology," by J. B. Jukes, fifth edition, edited by A. J. Jukes-Brown (Edinburgh: A. and C. Black).—"Scottish Journal of Natural History."—"Insect Life."—"Journal of Microscopy."—"The Treatise of Democritus on Things Natural and Mystical," translated by R. R. Steele.—"Primitive Architecture," by Barr Ferree.—"Further Records from Ireland," by A. Bennett.—"Victorian Naturalist."—"Canadian Entomologist."—"Nature Notes."—"The Naturalist."—"Cassell's Technical Educator."—"Revue Scientifique."—"Research."—"The Amateur Photographer."—"The Botanical Gazette."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope," &c., &c.

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

ON THE COMMON WASP, CHIEFLY AS COMPARED AND CONTRASTED WITH THE HIVE-BEE.

By J. YATES.



If we lay bare a wasp's nest in November, we shall of course witness a great commotion amongst the inmates, but the experiment may be made with impunity, as the wasps are now so benumbed with cold and scanty fare that they no longer attempt to sting.

On close inspection, three kinds of wasps may be observed—"small neuters,* or workers, now few in number," "middle sized sting-less males," "and from two hundred to three hundred large wasps"—these are the queens or fertilized mothers which will make their appearance in the sunny weather of the next spring. These only survive the winter—some few of them remain in the nest, but the greater proportion of them hibernate in warm and sheltered spots, in nooks and crannies, in the thatch of cottages, in straw ricks.

When the bright sun of March arrives, they are revived to life and activity, and then they may be seen about every hedge-bank seeking for a suitable hole in the ground where each may found a vespiary or commonwealth.

Having made choice of a suitable spot, the queen at once commences to scoop out the soil, and carry it away in her jaws ; soon a vaulted chamber is made a foot or more beneath the ground.

* These neuters are imperfectly-developed females.

Next she proceeds to old stumps and decayed wood, from whence she nibbles away small fragments of woody tissue by means of her strong mandibles, these she carries home in the shape of small rounded pellets, then she masticates them thoroughly, mingles them with glutinous saliva, and finally succeeds in manufacturing a strong kind of paper.

The wasp is thus the first paper manufacturer on record !

And now my first contrast with the hive-bee might be made.

"A lucky person," it is said, "is born with a silver spoon in his mouth." The queen-bee is in this happy state, from birth to death she does no stroke of work ; when ushered into the world she finds herself surrounded with troops of servants and friends, who administer to her enormous appetite, keep the hive warm or cold, build the cells, supply the food, and tend upon the young.

The sole business of the queen is to lay eggs ! But the queen-wasp is far differently circumstanced : she has to work hard all the day long. The first use she makes of the paper she has just manufactured is to twist it into a strong cord, and fix it firmly to the roof of her abode, then she makes a cell at the other end of the cord, around which she proceeds to build many other cells, and in each of these she lays an egg. In due time the eggs are hatched, and footless grubs emerge ; these pass through the larva and pupa stages, and at length a young colony of wasps, ready and willing to work, is started.

Henceforth the queen leaves the nest no more.

The wasp exhibits as much ingenuity in making her combs of paper, as the bee does with her wax, but they start on a different footing : the bee is more highly favoured by nature, than her cousin—the wasp. She (the worker) is endowed with wax-secreting glands, which are situated between the joints of her abdominal harness. It may be of interest to mention that these glands were discovered by a French peasant in 1768, previous to which date all the savants imagined that the wax was made out of pollen; but, as proved by Reaumur, it is made out of honey only.

When wax is required, the function of the glands is excited by the bees artificially increasing the temperature of the hive, and then the wax begins to flow in a fluid state.

The wasp has no such store of material for building —she (both queen and neuter) can only obtain the necessary material by hard work.

According to Lord Brougham, bees and wasps are marvellous mathematicians, since they have solved the problem of making perfect six-sided cells with the least possible expenditure of material. This is a scientific fallacy; in the first place, the cells are not perfectly hexagonal; and in the second place, the workmanship does not proceed from thought and measurement, but results from the mutual pressure of adjoining cells, and thus the process is entirely mechanical.

The combs of bees are arranged vertically; the combs of wasps horizontally. The reason of which is not far to seek. "Bees collect and store up honey, which of course would run away if the cells looked downwards," but as wasps collect no stores, their cells may safely look downwards, particularly since their young are provided with claspers at the end of their tails, which prevent them from falling out, and by means of which they can project their heads out of the cells when about to be fed.

Bees make cells on both sides the central plane or axis; wasps only on one side of the comb.

Wasps clothe their vespiary with ten or twelve layers of paper, through which at the lower end they leave two openings—one for entrance, the other for exit. Thus they avoid mutual collision.

These thick layers of paper thoroughly protect the comb from wind and rain, both when the nest is on the ground, and when in the open air, in those species of wasps which build in bushes.

When the nest has to be increased in size, more soil is dug out and carried away, and thus the vaulted chamber is enlarged; then the inner layer of paper is removed and utilised for the enlargement of the circumference of the comb, and for the fabrication of another and outer layer of paper.

The political economy of the vespiary and of the hive is conducted on the same principles.

In the time of Shakespeare everybody fancied the head of a hive was a king.

"They have a king and officers of sorts." * So he writes at the commencement of a celebrated passage. This view was in exact accordance with those of antiquity; thus Virgil, in his fourth Georgic, described kings as leading forth the swarms, and two kings are joined in mortal combat at verse 67. But a far stranger notion filled their minds; with Aristotle at their head, they denied the existence of fertile females amongst bees—they imagined they gathered the germs of their young from flowers and leaves of plants.

> "Verum ipsæ è foliis natos et suavibus herbis
> Ore legunt."—*Georg.* iv. 200.

In reality, as is now well ascertained, a queen is the central figure, and ruler of the family; from her all the progeny are directly descended, with a small exception shortly to be mentioned.

Sterile workers constitute the vast majority of the commonwealth, but late in the season males and fully-developed females make their appearance, in considerable numbers, in the vespiary. In the hive, the queens are always few in number.

Both bees and wasps possess the remarkable faculty of altering the sex of their offspring at will. This is accomplished by the simple process of varying the quality and quantity of the food administered.

Every description of nutriment, as is now well known, is reducible to two classes: the carbonaceous and the nitrogenous, both of which are required by all living creatures.

Bees obtain both kinds of food exclusively from flowers—the carbonaceous principle from the nectar, the nitrogenous from the pollen.

Wasps, on the contrary, get their carbonaceous food partly from the nectar of flowers, but chiefly from the juices of our choicest fruits, such as apricots, apples, plums, gooseberries, &c. Their nitrogenous nutriment they obtain from captured flies and other insects, and from flesh-meat.

Bees store up honey manufactured from nectar by a kind of digestion in their honey-sac or crop, and the honey is preserved from decomposition or fermentation by the addition of a little formic acid to each cell.*

The formic acid is obtained from the poison-sac of the sting; hence the sting, or rather one of the constituents of the poison-sac, is not intended chiefly for defensive purposes, but for the higher and more useful purpose of preserving their food.

They also store up their nitrogenous supplies in the shape of bee-bread, which is compressed pollen.

(*To be continued.*)

AN AQUATIC GARDEN.

By W. Augustus Carter.

BENEATH the Malvern Hills in the neighbourhood known as Malvern Wells, there is situated one of the most interesting and instructive establishments of the kind in the United Kingdom, viz., that devoted to the culture of birds, fish, and

* Henry V., act 1, scene 2.

* The sugar which is contained in the nectar of flowers is in the form called "cane-sugar," but after digestion it is converted into the grape-sugar form.

other animals, offering themselves for sport and food to the masses. Nor is the establishment confined merely to the propagation of live stock, but includes in its range of operations the manufacture of guns, traps, alarms, foods of all kinds, and every requisite of the sportsman. But it is not of this that I wish to speak, but of one section alone, which particularly attracted my attention, viz., the Aquatic Garden, or Fish Culture establishment. It was a bright sunny day when I visited it, and, conducted by Mr. John Burgess, I walked through it and inspected the multifarious features of interest presented to view. In the first place, I was confronted by long rows of ponds through which the water passed, and its roar could be heard as it rushed through the sluices. But the water, no matter how turbulent it may become, is held thoroughly under control, so that at any moment it can be arrested in its course or moderated in its speed. Springing upwards in the water is a luxuriant growth of many species and varieties of weeds which impart to the water a singular beauty. Some thousand different kinds are represented, and Mr. Burgess informed me that it was his intention to introduce some valuable varieties in course of time. Beneath the shelter of the weeds swim many thousands of trout and other fish, in perfect safety, free from the multitudinous enemies which would have surrounded them had they been born in open waters. Under the influence of careful preservation, protection, and good living, they flourish exceedingly, and as one lusty trout after another rushes out of its hiding-place before my optics, I am able to form a correct conclusion upon their rate of growth. Many of them are nine inches long, and these, Mr. Burgess informs me, are yearlings, having been hatched out artificially this time last year. I go forwards along the path situated at the side of the ponds to the salmon ponds, and here I observe the same prosperity reigning among the fish and the same principle underlying their method of culture. In one of the ponds Mr. Burgess points out a landlocked salmon, that is, a variety content to abide permanently in fresh waters, and which does not descend to the sea, like the *salmo sala.* Truly, it seemed quite contented with its lot, and judging by its growth, which was eight inches in one year, it had found its habitat quite satisfactory. Onwards I sped to other sections of these wonderful aquatic gardens; and under Mr. Burgess' leadership came to the lowly denizens of fresh waters. It would never do to mix carp, roach, tench, etc., with the kings and princes of the finny tribes which I had just left, therefore, they are wisely confined in other quarters, just as comfortable and complete in arrangement, but made on different principles. I remarked to Mr. Burgess upon the large amount of space which he gave up to them, and he replied, "true, but it is not the expense and trouble incurred in their propagation that I mind, if I can but encourage the cultivation of these neglected coarse fish." The humble angler will rejoice at these words, for he has long since agitated his mind as to the future of the fish he loves to angle for on Sunday mornings when he communes with nature and his float. Here at least is one champion of the finny lower orders, and may there be many more, because, much as I regret to say so, there is a decided falling off in the numbers of the fish in question. Mr. Burgess says truly, "that river traffic does tremendous injury to their ova," which are shed on the rushes and weeds and oftentimes washed away and destroyed. What interested me greatly in this aquatic garden was the section devoted to fish acclimatization. A worthy science this, and one closely knit with fish culture being capable of effecting much good! But Mr. Burgess considered that it was also capable of doing much injury, and deprecated the hap-hazard planting of foreign fish, for, said he, the act of stocking open waters with a strange fish whose habits are unknown, is nearly as destructive as pouring into waters noxious ingredients. The one upsets the balance of nature, the other occasions plague and famine. In enclosed waters, Mr. Burgess said, the case is different, and great advantage is frequently gained by turning suitable foreign fish, say of transatlantic origin, therein. In one of the ponds I saw the whitefish of America; in another, the rainbow trout of California; in another, the brook char of the United States, &c., all of which were prospering, and exceeded our own fish in rate of growth.

After inspecting all the ponds I retraced my steps and was led by Mr. Burgess to the hatcheries, and there I saw the first stage of all in the operations of fish rearing. On all sides of me, as I entered the houses, were rows of tanks filled with ova, which were yielding the tiny trout and salmon, and which could be observed, long before they issued forth, inside the ova struggling to free themselves of their shells. Very curious objects they looked in the water as they strove to exercise their newly acquired organs of propulsion with but a small amount of success, and the effort which it cost them was so great as to occasion them to indulge in repeated and prolonged periods of repose. Here, then, was the storehouse of infant fish-life that will shortly be distributed in barren waters, or in those requiring supplementary supplies; and millions of young trout propagated by this artificial system will be sent to any part of the kingdom whose waters may require stocking. The distribution of fish-life brought about by the improved methods of transmission is now an easy matter. Mr. Burgess, who has invented and manufactured his own fish carrier, says he never experiences any loss in transmitting fish, and added, by way of illustration, that a few days since, some perch were sent to the north of Scotland by him, and although confined in his fish carriers for forty-eight hours, they arrived quite safely at their destination.—*Naturalist.*

THE REEF OFF PERNAMBUCO.

A FEW remarks concerning the wonderful reef which forms the natural breakwater and harbour of Pernambuco may be interesting to the readers of SCIENCE-GOSSIP.

Pernambuco is an important seaport on the coast of Brazil, and consists of three portions, Recife on the sea border, San Antonio on an island, and Boa Vista; these are connected by bridges over the rivers Caparibe and Berberibe, which debouch here. It is not too much to say that this town owes its very existence to the presence of this hardened sandbank lying off its front.

All up and down the coast of Brazil, from Cape St. Roque to the Abrolhos, extends more or less a chain of sand and mud banks parallel, and a short distance off the coast; in some places, as off Pernambuco, being just awash at high water, and in other places much broken up, and under water all the time. The top of these reefs is the home of innumerable lime-secreting animals, chiefly corals and shell-fish. But in no place, probably, does the reef obtain such proportions as off Pernambuco. Here it has an unbroken length of 1⅗ miles, with an average breadth of about 35 yards, which at high spring tides is just awash. On the end at the entrance into the harbour is situated an old Dutch fort and a lighthouse, and for a short distance in from these the reef has been built up with bricks. The top of the reef is flat, sloping down gradually to seaward, and abruptly on the inshore side, chiefly due to the scouring action of the rivers, which in some places have undermined the banks very much, causing huge pieces to crack off; this continually going on will gradually wear the reef away, unless steps are taken to check this action. On the top of the reef very long cracks may be seen, which, however, only penetrate to a short distance, and all over are little pools and tunnels only a few inches deep, but forming all sorts of little nooks and corners. The surface is extremely hard: fairly ringing when struck with a hammer, and standing up in sharp jagged points and knife-like edges, which are often covered with acorn-shells. The hardness of the sandstone rock of which the surface is entirely composed is due to the cementing of the particles together by the lime solution from the corals and shell-fish, etc. Borings taken in many places reveal the fact that the reef is made up of layers of sand, blue mud, broken shells and gravel, which are deposited in various thicknesses. While on the steep river edge there is very little life except minute hermit crabs, on the top and seaward side it is fairly alive with lovely fish, corals, echinoderms and green seaweeds. The most common fish is a species of goby, which throngs all the pools, and when closely pursued will make astonishing leaps and bounds from one pool to another over the surface of the reef; there are also several kinds of lovely coral fishes which live well in an aquarium, some I had becoming so tame that they would take little shrimps from my fingers. The seaward edge just above low-water mark is honeycombed in all directions by short thin-spined sea-urchins of a dark-brown colour, while in every pool are specimens of astrea corals, chiefly a brown and a green variety, but in no case are they so plentiful as to form an important factor in the growth or maintenance of the reef. I am told, though, that at Maceio—a short distance down the coast, where there is a somewhat similar reef—the corals are very abundant and do form an important factor in the maintenance and increase of the reef. One thing that is very striking on the reef, is that the water in the pools is often raised to a high temperature by the

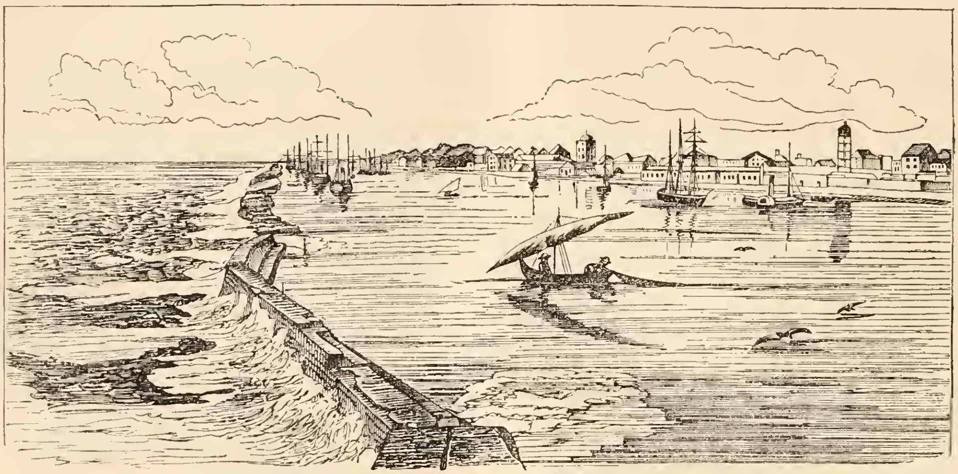


Fig. 73.—The Reef off Pernambuco.

vertical sun, so that it is strange the fish can survive until the water is cooled by the returning tide.

From a consideration of the formation and position of these "reefs" it seems probable that their formation is due to matter brought down by the rivers, which on entering the sea is drifted parallel to the coast by the prevailing currents. This action is assisted by the constant easterly winds which blow here. Mr. Darwin attributes the formation of the "reefs" of Pernambuco to the action of the currents.* The whole formation is one of extreme interest, and I would commend it to the notice of naturalists who seek for fresh fields of discovery and research. All up and down the coast we have many species of corals flourishing in a warm water current, and yet there are no true reef builders.

On examining the charts we see the soundings

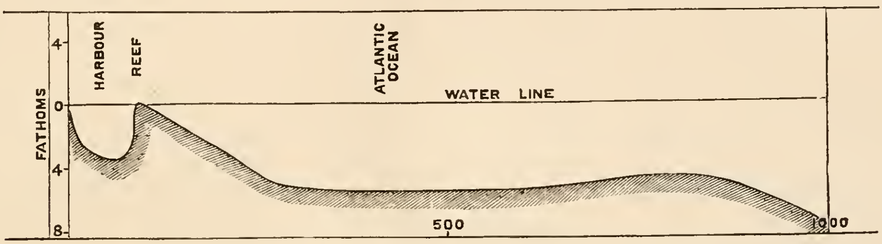


Fig. 74.—Section across the Reef of Pernambuco, from Arsenal North Boat Basin for 1000 fathoms.

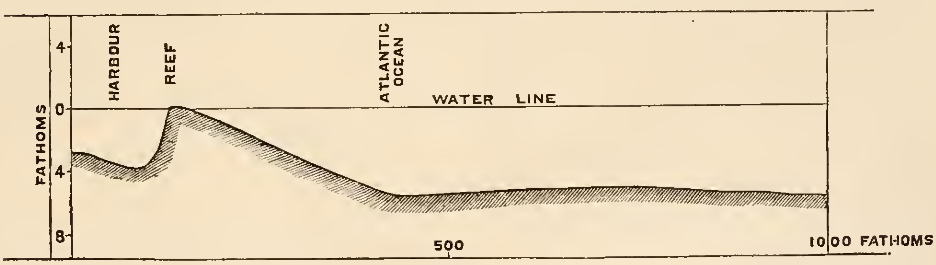


Fig. 75.—Section from near Buoy in centre of Mouth of River Beberibe for 1000 fathoms. (Vertical scale 48 times that of horizontal. Figures denotes fathoms).

marked crl. (coral) over a large area up and down this coast even out into deep water, but this is due to large areas of the bottom being covered with Celleporæ and Nulliporæ. On one piece of cable I picked up, which had been down eleven years undisturbed, the Celleporæ had grown on it to a thickness of nine-tenths of an inch; as it was quite dead, it may have taken far less time than this to attain that thickness.

Two other places are worth visiting near Pernambuco, and are easily accessible, thanks to the admirable system of tramways. Dois Irmãos, where are the waterworks which supply the town with drinking-water, and the Red Cliff near Olinda, caused by a landslip, and showing the red marl which is so common over a large part of Brazil.

* See "Voyage of a Naturalist," p. 498.

The plan shows two sections through the reef carefully drawn to scale, and illustrates clearly the formation of the reef.

DAVID WILSON BARKER.

ASTRONOMY.

By JOHN BROWNING, F.R.A.S.

AT the meeting of the Royal Astronomical Society, held on April 11th, a paper by Mr. Schaelberle was read on "A Mechanical Theory of the Corona." Photographs were sent to illustrate the paper, of a ball with many wires projecting from it in curved forms intended to represent the rays of the corona. The theory put forward by Mr. Schaelberle is that the striking differences which may be observed in the form of the corona can be accounted for if we suppose the axis of the sun to be inclined so that the projecting wires may be seen from different points of view.

Mr. Wesley said that if Mr. Schaelberle's theory is correct, all coronas observed at the same time of the year ought to be similar in appearance, but that this is certainly not the case, as several eclipses which have occurred in December have presented very great differences in appearance.

Mr. Maunder read a paper on sun-spots in 1889, in which he said that sun-spots were so sparse in 1886 that astronomers generally supposed that the sun-spot period had been reached; but that since 1886 there had been still less solar activity. At the present time, however, there were many signs of greater solar activity. In 1886 the average duration

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for June.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	4	3 47M	11 27M	7 7A
	11	3 20M	10 54M	6 28A
	18	2 57M	10 34M	6 11A
	25	2 40M	10 28M	6 16A
Venus ♀	4	5 30M	1 55A	10 20A
	11	5 45M	2 4A	10 23A
	18	6 2M	2 13A	10 24A
	25	6 23M	2 20A	10 17A
Mars ♂	4	7 15A	11 11A	3 13M
	11	6 37A	10 34A	2 36M
	18	6 1A	9 59A	2 2M
	25	5 28A	9 26A	1 29M
Jupiter ♃	4	11 35A	4 9M	8 39M
	11	11 8A	3 41M	8 10M
	18	10 39A	3 12M	7 41M
	25	10 10A	2 42M	7 10M
Saturn ♄	4	9 56M	5 11A	0 30M
	11	9 31M	4 46A	0 4M
	18	9 7M	4 20A	11 33A
	25	8 43M	3 55A	11 7A

of spot-groups was ten days; in 1887 seven days; in 1888 six days; in 1889 it was twelve days.

On June 17th there will be an annular eclipse of the sun, which will be partially visible at Greenwich as a partial eclipse, beginning at 8 hrs. 20 min. morn., greatest phase at 9 hrs. 14 min. morn. and ending at 10 hrs. 31 min. morn.

On June 29th there will be an occultation of β 1 Scorpii, a star of the second magnitude. The disappearance takes place at 9 hrs. 59 min. aft., the reappearance at 11 hrs. 13 min. aft.

In June, Mercury is a morning star in Taurus.

Venus is an evening star.

ANIMALS AND MEDICINE.

By Hulwidgeon.

II.—Insectivora.

Hedgehog.—Although I cannot find this animal mentioned in accredited prescriptions, there can be little doubt of its having been pressed into the service of pathology. It was regarded as edible, if not delectable, and the subject of many peculiar recipes among country people; while the favour in which it has been held by gypsies from time immemorial, as a dietary tit-bit, is perfectly well known. It was, moreover, of some esteem in farriery.

Horse-doctoring I must acknowledge to be outside the limit of my subject (or the theme would be endless), but I shall take the liberty of quoting a remedy therefrom, for want of a better illustration of this creature's repute in human doctoring. For horses whose wind is broken, Howard bids us: "Take the guts of a hedgehog, dry them, and pound them to powder, and give the horse two or three spoonfuls of it in a pint of wine or strong ale; then mix the rest with anise-seed, liquorice and sweet butter, of which make round balls or pills and give him two or three of them after drink." *

Shrew.—Gilbert White has told us with what detestation the shrew was regarded in his time, and how it was immolated to furnish the vaunted shrew-ash "whose twigs or branches, when gently applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a shrew-mouse over the part affected."

Of most animals, justly or unjustly, deemed to be venomous, the favourite method of curing the wounds they inflicted was by the application in some more or less ludicrous and irrational manner of a portion of the creature's own body. The cruel stigma that was attached to the little shrew, therefore, although we do not find it enumerated in the Materia Medica, introduced it into the common practice of medicine. The shrew-ash was probably as frequently called into requisition by simple rustics for their own cure as for that of their cattle. But there were other shrew-charms of equal reputed efficacy. According to the late Rev. J. G. Wood, in those bygone days "a shrew cut in half and placed on a wound supposed to be caused by its bite, was considered a certain remedy." This seems to have been the favourite mode of application; its simplicity no doubt recommending it.

III.—Carnivora.

Cat.—Of the curative virtues of puss we cannot deduce much from medical treatises and pharmacopœias; for, like her other qualities, these, although many, seem to have been of a domestic nature and of renown chiefly within the limits of the home circle. They were far from insignificant, however. A writer recently suggested that these may possibly have gained for puss the veneration she received from the ancient Egyptians.† At any rate, they "were believed in, not so many years ago, even in England. A whitlow on the finger could be cured by putting it for a quarter of an hour in a cat's ear. Or, if you suffered from epilepsy, all you had to do was to take three drops of blood, obtained from a vein under a cat's tail, in a glass of water, and you would be healed. The burnt ashes of a black cat's head were

* Howard's "New Royal Cyclopædia" (embracing "every article worthy of notice in 'Chambers's Cyclopædia,' the 'Encyclopædia Britannica,' and every other dictionary of science in the English or French languages, and all the valuable new discoveries in the 'Philosophical Transactions,'" &c.), London, 1790, vol. i., p. 398.

† "Evening Standard," 19th March, 1890.

good for sore eyes, and the fat of the wild cat was openly sold by chemists as a remedy for a variety of disorders."

Civet.—Ancient Sir John Maundeville, writing of the palace of Caydon in Cathay (Cap. XX.), tells us how "All the walls are covered within with red skins of animals called panthers, fair beasts and well-smelling; so that, for the sweet odour of the skins, no evil air may enter into the palace. The skins are as red as blood [artificially?], and shine so bright against the sun that a man may scarcely look at them. And many people worship the beasts when they meet them first in a morning, for their great virtue and for the good smell that they have; and the skins they value more than if they were plates of fine gold."

This apparently harmless and unquestionably odoriferous "panther" was, in all probability, the civet of the moderns, of whose natural history inaccuracy seems to have been epidemic down to recent times. The usually cautious "Nature Display'd" makes a great lapse from the truth when it comes to speak of this animal. After describing the lodges of beavers, it continues (p. 221): "Travellers ascribe almost the same inclinations and labours to the civet-cat, who is an animal peculiar to America and larger than our house-cats. This creature, in every particular, is a beaver in miniature, and therefore it would be needless to make him the subject of any further discourse."

Dr. Smollet, in his "Present State of all Nations,"* enumerates the "musk-cat" among the wild animals of Hindostan. He describes it as "about the size of a hare, and the musk is contained in a kind of bladder or purse under the belly." This musk he includes among the exports from Hindostan (vol. vii. p. 184) and from China (vol. vii. p. 49) the celestial musk-rat yielding "that noble perfume" in the same manner as its Indian relative. Having regard to the large number of musk-producing creatures, I was a long while reconciling this description with that of the civet; but I am unaware of any creature to which it applies more accurately.

Zibethum, civetta or civet (from the Arab *sebet* or *zobeth*), according to Hooper (p. 868), is a "soft, unctuous, odoriferous substance, about the consistence of honey or butter; of a whitish, yellowish, or brownish colour, sometimes blackish, contained in some excretory follicles near the anus of the *Viberra Zibetha* of Linnæus. It has a grateful smell, when diluted, and an unctuous subacrid taste, and possesses stimulating, nervine and antispasmodic virtues." All the same, it was a "drug now only used by perfumers" (p. 207).

A few years previously Howard had given an almost identical description, and remarked: "It is used chiefly in perfumes, rarely or never for medicinal purposes, though the singular effects which musk has been lately found to produce may serve as an inducement to the trial." Presently we shall find that this suggestion had already been realised in the cases of both musk and civet, and seemingly without having elicited any token of disapprobation.

Howard, having ventured on this surmise, naturally gives us a full account of the producer of the substance; more complete than correct perhaps. "The civet-cat, *zibetha*," he says (vol. i. p. 529), "is a little animal, in shape resembling the wolf or dog; its snout is long and small; its ears small and rounded; its hair is like that of a badger, but very soft; its feet small and legs short. Civet has a very fragrant smell, so strong as, when undiluted, to be disagreeable. . . . It unites with oils, both expressed and distilled, and with animal fats; in watery or spirituous liquors it does not dissolve, but both menstrua may be strongly impregnated with its odoriferous matter, water by distillation and rectified spirit by digestion; by trituration with mucilages it becomes soluble in water." It was "brought from the Brazils, the coast of Guinea and the East Indies.

There is a very considerable traffic of civet from Bassora, Calicut, and other places, where the animal that produces it is bred; though great part of the civet among us is furnished by the Dutch, who bring up a considerable number of the animals." With regard to its former application to medicine, it was hardly to be expected that, among all the noxious messes that then did duty as curatives, the chief of perfumes should not have been blended with them as a palliative. All manner of vegetable essences were called into requisition for that sole purpose, and so, in fact, were such fragrant animal products as ambergris, musk, and civet.

Bate employed this very uncleanly flux of a cat very largely. He seems to have had an inkling of its real or pretended intrinsic merits, but generally, there is little doubt, used it with the prime idea of making his mixtures more attractive. In this capacity, probably, he included it in his pectoral troches and breath-sweeteners (p. 665); but even as a scent it was not altogether unsuspected of medicinal properties. In conjunction with musk it occurs in (p. 629) the *Pulvis crinalis*, a powder "for to cause hair to grow and to strengthen and confirm its roots. It also recreates and comforts the brain and memory." Of this compound Salmon remarks that, "the effects it has upon the brain and memory is (*sic*) rather from its scent than its substance." Further instances of Bate's employment may be found (for example), in the *Balsamum fœminarum* (p. 682), and *Unguentum Virilitatis* (694). To the latter Salmon adds some obnoxious ingredients and doubles the proportion of civet—previously 1 scruple to 5½ drams of the ointment.

Salmon, indeed, more than confirmed its use. In

* Vol. vii. p. 161. London, 1769.

a recipe for *Spiritus Ambræ* (p. 36), he says, "If a few grains of civet be added to the composition, the tincture will be yet richer, for that the bodies of the musk and amber will be thereby more admirably opened, it being a more excellent and volatile sulphur." In another recipe he repeats the addition, "Where note, that the civet and spirit of roses are added, the better to open the bodies of the other perfumes;" and, again, in the *Tinctura Ambrægrisæ*, (p. 220), "civit and burning spirit of roses are added, the better to open the bodies of the other perfumes." Among other prescriptions Salmon also inserts musk and civet in the following:

The "most odoriferous essence," *Essentiis Regia*, (p. 157), recommended as "a great cardiack . . . and takes away fainting and swooning fits . . . and they who love tobacco may perfume their tobacco with the same."

The "excellent cosmetick," *Tinctura Amygdaloides* (pp. 171–2), which was warranted to cure asthma, erysipelas, sore eyes, and all manner of skin eruptions.

The "admirable pulmonick," *Flores benzoini*, which, its author rather unfortunately tells us, "helps deafness, noise and pains in the ears," &c.; and other recipes (pp. 377–82).

Fig. 76.—Hedgehog.

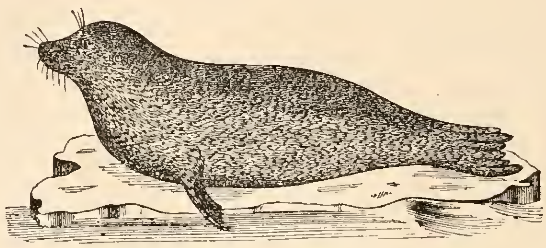


Fig. 77.—Seal.

DOG.—One of the most remarkable of former remedies, and one held in great repute for disorders of the throat, was the fæces of dogs. This reputation perhaps arose from the premise that such complaints were very prevalent among the dog kind, and from a belief in the ancient maxim—so often applied in the healing art—that like will conquer like: the "hair of the dog that bit you" principle. But it is possible that the origin of this remedy had a still more frail foundation. Cynanche (literally dog-strangle), was the generic name given to sore throat, mumps, quinsy, and other ailments of the cervical region, and cynanchica were the medicines applied for their relief. Hooper derives these names "from dogs being said to be subject" to the said affections (pp. 247 and 595); but he probably indicates their true origin when he observes that in *C. trachialis* (or croup), the patient utters a sound "something between the yelping and barking of a dog." It is likely that the ancients adopted these canine designations from the resemblance of the noise of coughing and husky speaking to that of a dog's voice, and that the names misled our too literal founders of modern physic into the ascription of kindred (and thereby curative) qualities to the dog itself and things doggy.

At any rate the *Album græcum* and similar preparations for a long while possessed a high value in the laboratory, and, in reputed cures for all kinds of cynanche, were of frequent, almost constant, occurrence. The excrement was preferred of a dry character and white colour, and generally underwent a preparation to modify its repulsiveness. Bate fairly teems with instances of its use from which I quote the following:

Linctus synanchicus (p. 616), "a lambative for the quinsie," included six drams of this ingredient, finely powdered. Salmon evidently approved of it, for he repeated the dose—a spoonful—"every hour, or hour-and-half at farthest, till the distemper seems to be alleviated."

Gargarisma synanchium (p. 675), included six drams of the white preparation. It was nominally "for a quinsie," but, we learn, also "good against ulcers of the mouth, thrushes, &c."

Emplastrum synanchicum (p. 703), included six ounces of the white kind, powdered, and mixed with oil of roses, flour, wax, and honey. It was "applied to the jugular and parts of the neck below the ears, where the pain is."

Cataplasma synanchicum (p. 705), "a pultice for a quinsey," included one ounce, white, mixed with conserve of roses and syrup of meconium (poppy juice). It was "to be applied under the chin, from ear to ear, after blood-letting."

Early in the present century, however, Hooper speaks with some shame of the use of this unsavoury nostrum. It was, he writes (p. 29), "formerly applied as a discutient to the inside of the throat in quinsies, being first mixed with honey;" but adds, "medicines of this kind have long since justly sunk into disuse."

The bones of the dog were utilised where animal salts or "spirits" were required. Dog's fat was thought to possess some virtue in colics, and portions of their hair or flesh, or the whole carcase were requisite in some superstitious treatments of hydrophobia.

FOX.—In colics, the abdomen was ordered to be "fomented all over with hot and rich oils," boiled in the fat of certain specified animals, of which the fox was the favourite. The same remedy was applied in the form of clysters. Vide Howard, vol. i. p. 551.

BEAR.—"The bear," writes Howard at the close of last century (vol. i. p. 320), "is a well-known animal of the cat kind; of some use in medicine, but more in commerce and sport." "Bear's grease is accounted a sovereign remedy against cold disorders, especially rheumatisms. Some have also employed it with success in the gout and against tumours and ulcers. To be good, it must be newly melted, greyish, glutinous, of a strong, disagreeable smell and a moderate consistence. That is adulterated with common tallow when it appears too white." Bear's skin, too, was "in some countries" made into "bags wherein to keep the feet warm in severe colds."

A hundred years previously, bear's grease was in equal favour as a hair-engendering ointment. Bate (p. 681) prescribes it as an "oyl for restoring hair fallen," and (p. 690) includes two ounces of it in every four of his *Unguentum criniscum*. This is how Salmon made our grandfathers apply the latter preparation "to breed hair and restore bald places": "You must first rub the place a good while with an onion, 'till the skin looks very red, and then you must anoint it with this ointment, laying over it a linen cloth dipt in the same, . . . in like manner repeated three or four times a day for five or six weeks together at least." If either the grease or onion possessed any efficacy, that ought to have made the most reluctant hair sprout.

BADGER.—This animal provided surgery with the softest of hair for its brushes, and pharmacy with a fat that had the preference over all others for certain purposes. Badger's grease was one of the components of Bate's *Balsamum spinale* (p. 685), for rickets. It was likewise one of the alternative fats mentioned in the recipe for colic, quoted under the head of "Fox."

WALRUS.—I shall refer to this pinnipedal carnivore in dealing with the cetaceans.

SEAL.—If the seal had been better known in British latitudes there can be little doubt that it would have been made very serviceable. As it was, it quite likely furnished a fair share of the animal oils used in medicine. In the Scottish Isles and northern sea-board, where it was procurable, we are aware that it was put to practical use. Smollet, writing in 1768 of Uist, says* :—

"On the western coast of North Vist rises the rock Eousmil, famous for being the scene of an annual seal-fishing in the end of October. . . . The natives of these islands pickle the flesh of seals with the ashes of sea-ware, instead of salt, and eat it occasionally with a good appetite. This meat is found to be astringent; but the liver, being dried, pulverized and given in milk, *aqua vitæ*, or red wine, is counted an infallible cure in the dysentery. Even persons of fashion will eat seal's flesh, when cured in the manner of ham, and the vulgar Roman Catholics on these islands are permitted to feed upon them in Lent as natives of the sea. Their skins are made into ropes, caps, pouches and girdles worn as preventatives of the sciatica."

* "Present State of All Nations," vol. i. p. 478.

OUR SCIENTIFIC DIRECTORY.

[The Editor will be obliged, if, for the benefit of his numerous readers, secretaries of scientific societies will send notices like the following, also place and time of meeting.]

LONDON Amateur Scientific Society: President, Professor J. F. Blake, M.A., F.G.S. Hon. Secretaries, W. J. Atkinson, F.G.S., 76 Christchurch Road, Streatham Hill, S.W., and Grenville A. J. Cole, F.G.S., Mayland, Sutton, Surrey. Meets at 10 Arthur Street West, London Bridge, E.C., on second and fourth Fridays at 8 P.M. Excursions on Saturday afternoons.

NOTES ON NEW BOOKS.

A HANDBOOK OF DESCRIPTIVE AND PRACTICAL ASTRONOMY, by George F. Chambers, F.R.A.S. (Oxford: Clarendon Press). Mr. Chambers' "Treatise on Astronomy" was deemed a classic work nearly thirty years ago. At that time there was nothing to beat it; but many aids to astronomical research and observation, now in common use, were then utterly unknown. The spectroscope, even if discovered, had not been astronomically applied. What a marvellous series of astronomical revelations is connected with that wonderful instrument! Again, what marvellously increased powers of definition and magnification have been gained by the telescope within that brief period! Stellar photography is hardly five years old, and yet the child has grown to be almost father to the man! No wonder, therefore, that Mr. Chambers, in this (the fourth) edition of his splendid work, should find occasion to remark that between the years 1877 and 1889 the development of astronomy has perhaps been more remarkable than in any precedent period. The present work to hand is in two goodly and well-bound volumes, but it is intended to include a third. The work will be published as follows: Vol. i. "The Sun, Planets, and Comets"; Vol. ii. "Instruments and Practical Astronomy"; and Vol. iii. "The Starry Heavens."

Each vol. is paged, indexed, and can be obtained separately. As a test of the lucid and fullest details of newest astronomical research we advise our readers to peruse chap. iii. (in vol. i.) on "Vulcan"; and chap. i. (book iv.) on "Comets." Book v., devoted to "Meteoric Astronomy," is remarkably clear, and attractive reading withal. The illustrations to this work are numerous and good. For fulness and perspicacity, as well as for its bringing astronomical facts up to the most recent date, we know of no work equal to Mr. Chambers'.

The School Manual of Geology, by J. Beete Jukes. Fifth edition, edited by A. J. Jukes-Brown (Edinburgh: Adam and Charles Black). We have had occasion to notice the last two editions of this work, and have now much pleasure in calling attention to the fifth. The latter is sufficient to prove the book has taken its place among standard works. Indeed, we know of no better school manual of geology extant. In this the latest edition Mr. Jukes-Brown has brought the book up to latest date in all things geological.

Larva Collecting and Breeding, by the Rev. J. Seymour St. John (London: W. Wesley & Son). We cordially commend this handy little book to all entomological students. To beginners it will prove a prize. The larval stage of Lepidoptera is not so well known as the others, but to those desirous of being guided by experience in this matter Mr. St. John's work will prove very handy for reference. The different food plants of larvæ are all detailed and, on the other hand, we have also a full list of all the caterpillars which feed on each plant.

American Spiders and their Spinning Work, by Dr. H. C. McCook, Vol. i. (Philadelphia: published by the Author). This splendidly got-up volume is a monograph of the orb-weaving spiders of the United States, with special regard to their industry and habits. They are based upon sixteen years' observations and studies. No other American naturalist was so fitted for the patient task as the author, whose well-known researches and observations on various kinds of ants must have been a capital education for studying the spiders. The latter are the reverse of ants, being solitary, whilst ants are social. Dr. McCook in the present volume deals chiefly with the character and construction of spiders' webs or snares. It also includes a careful study and description of the spinning organs of various kinds of spiders. During his sixteen years' study of spiders and their webs, Dr. McCook informs us, he made several thousands of original sketches. Some of the best of these, to the number of nearly 350, illustrate the present volume, and they are all of a high-class artistic character. Dr. McCook divides his work into seven parts, which include nineteen chapters. The parts are as follows: "Structure and Spinning Organs," "General Characteristics, Construction, and Armature of Webs," "Characteristic Forms and Variations of Snares," "Unbeaded Orbs and Spring Snares," "Mechanical Skill, Intelligence, and Equipment," "Provisions for 'Nurture and Defence,'" and "Nesting Habits, Protective Architecture, and Development." No more careful or original work on natural history than this has been given to the world for many years. Its perusal is delightful; and the amount of knowledge concerning the lives and habits of those little-known though common objects, the spiders, is marvellous to a degree.

The Flowering Plant, as Illustrating the First Principles of Botany, by J. R. Ainsworth Davis (London: Charles Griffin & Co.). This is an admirably-designed book, intended for use in the London University Matriculation, as well as in the South Kensington Examinations. The author conducts his reader after a simple method through the various departments of botany, beginning with elementary morphology, and physiology, and then proceeding to deal with the root, the stem, buds and leaf arrangements, foliage and scale leaves, bracts and floral leaves, essential floral organs, the physiology of flowers, seeds, and fruits. A good deal of practical work is insisted upon, and the student is carefully instructed therein. There is also a chapter of examination questions, if the reader care to test his own knowledge. The illustrations are numerous and effective. Altogether, we cordially recommend Mr. Davis' little book to all intending students of botany.

British Fossils, by J. W. Williams (London: Swan Sonnenschein & Co.). This is one of the admirably got-up and cheap "Young Collector" series. It is very well done, considering the small space at the author's disposal, but it will suit nobody but a very "young collector," and it is to be feared that such an one would not be attracted by the multitude of italicised names of various fossils. Mr. Williams gives us chapters on the life of the Primary period, ditto of the Secondary, ditto of the Tertiary, and ditto of the Post-Tertiary (Quaternary). One of the most useful chapters is the short one relating to the collecting of fossils, and the list of geological books likely to be useful; also the chapter giving a short list or glossary of geological terms.

A Class-book of Geography, Physical, Political, and Commercial, by W. B. Irvine (London: Relfe Bros.). The author is already favourably known in educational circles by his *Geographical Text-book for Beginners*. The present volume is intended for intermediate and senior pupils, and it is certainly the best devised and arranged work of the kind we have ever come across.

Studies in Evolution and Biology, by Mrs. Bodington (London: Elliot Stock). The accomplished author is well known to our readers, by her contributions to SCIENCE-GOSSIP, as a graceful and thoughtfully suggestive writer. This collection of articles and essays, by a person skilled in the writings of all the great naturalists, and competent to set forth in a pithy and attractive style their best thoughts, theories, and hypotheses, ought to be acceptable to that increasingly large circle of readers who are interested in all the great geological and biological questions of the day. The large scope of Mrs. Bodington's prettily got-up and well-printed book will be gathered from the titles of the following chapters: "Some Curious Facts connected with the Evolution of the Eye;" "The Mammalia, Extinct Species and Surviving Forms;" "The Flora of the Past;" "Interesting Facts in Evolution;" "Micro-Organisms as Parasites;" "Puzzles in Palæontology;" "The Air-bladder of Fishes considered as a Degenerate Lung;" "Neo-Lamarckism;" and "The Origin of the Fittest." Mrs. Bodington's thoughtfulness for her readers is further exemplified by the admirable glossary at the end of her delightful little book.

Proceedings of the Literary and Philosophical Society of Liverpool (London: Longmans & Co.). Vols. xli., xlii., and xliii. It is a pity these valuable papers are not bound uniformly. Vols. xli. and xlii. are in a good roan cloth binding, whilst xliii. is in paper, and of a different size. We have observed this lack of bibliophilic continuity before. There are few of our provincial scientific and literary societies which stand higher, or possess a greater and unbroken antiquity than that of Liverpool. Its annual volumes are always interesting—sometimes they are even important. The papers they contain range over a large area of literary and scientific surface, and are often written by men of light and leading in both literary and scientific circles. Thus, in vol. xli. we have papers by Prof. Herdman, R. J. Harvey Gibson, Isaac Roberts (on "Stellar Photography"), Eli Sowerbutts, H. H. Higgins, T. J. Moore, Fletcher-Williams, G. H. Morton, etc. In vol. xlii. other papers, etc., by H. H. Higgins, T. P. Kirkman (the sworn foe of poor Herbert Spencer), W. F. Denning, J. E. Gore, T. F. Heyes, C. E. Brewster, etc. Vol. xliii. includes papers by the Rev. T. P. Kirkman, Dr. Newton, Isaac Roberts, H. H. Higgins, Dr. Nevins, James Birchall, Principal Rendall ("The Cradle of the Organs"), etc., etc.

THE NEW HYDROBIA.

It is a hard case when any one is asked to define precisely what is the difference between a species and a variety. Both terms are to some great extent arbitrary, and every systematist has his own notions of them, so that their needs must be more or less confusion. Perhaps this is nowhere better shown in the conchological world than in the discussion which has ensued over this so-called new hydrobia between Mr. Marshall and Mr. Smith, in the recent numbers of the "Journal of Conchology." Mr. Jenkins has placed these views together in an article which appeared in the May number of this journal. But in such a question I am of the opinion that a certain amount of comparison with other varieties of species should be taken into account, especially when the conditions under which the hydrobiæ live are taken into consideration. Evidently *H. Jenkinsi*—Mr. Jenkins kindly sent me specimens—approximates nearer to *H. ventrosa* than to *H. similis*, and is either a variety of the former, or else a new species. Mr. Marshall considers it to be a variety; Mr. Smith, on the other hand, thinks it to be a new species. As it is nearer to *H. ventrosa* the differences as enunciated by Mr. Smith concern us. He says that these are "(1), in habit; (2), length and form of tentacles; (3), colour of the foot and head, and (4), in the greater size and more robust form of the shells," ("Journ. Conch." vol. vi. 1889, p. 145). On these several headings I would like a few words. "Habit" may be an expression simply and solely of changed conditions, or in other words, of varietal rank merely. And under this "habit" the other differences enunciated may be considered. "Length and form of tentacles, colour of the foot and head, and the greater size and more robust form of the shells," may all be due to these changed conditions or "habit." Taken separately, each of these distinctions which are given as specific are merely varietal. "The greater size and more robust form of the shell" occur together in many species as varieties: instance, *B. tentaculata* v. *ventricosa* (Menke), *L. auricularia* v. *magna* (Colb), *L. palustris* v. *obesa* (Taylor), *H. pomatia* v. *gesneri* (Hartm.), *H. aspersa* v. *globosa* (Moq.), *H. nemoralis* v. *ponderosa* (Malm), *H. arbustorum* v. *conoidea* (Westrl.) among others. "The colour" is also varietal; many of our species vary much in body colour, and it is well known that colour is never specific in any case, whether of body or shell. Take, for example, the slugs, and *L. peregra*, of which, rightly or wrongly, varietal names have been given to the various body colours. "Length and form of tentacles" are of minor importance, and even do not indicate varietal rank, let alone specific. Many examples of one species vary much in the length and shape of their tentacles. Thus I am inclined to believe, with Mr. Marshall, that so far as these specimens have been examined, they are varieties of *H. ventrosa*, and are not entitled to rank as a true and distinct species. But I would like to point out that in neither case has there been any mention of their internal anatomy. That is the only criterion which would once for all settle the dispute. If they do not differ in anatomy from *H. ventrosa*, then are they surely varieties of that species; if indeed they do differ, then are they as surely a distinct species. At the conclusion of his very interesting and instructive paper, Mr. Jenkins mentions that our *Dreissena polymorpha* originally came from America. This is new to me, and I have always been prone to regard them, in common with many other conchologists, as members of the old

Aralo-Caspian fauna (*cp.* Forbes and Hanley in "British Mollusca," F. T. Koppen and Nehring "SB. Nat. Fr." 1883, pp. 68, 69), whence they have migrated northward by the Volga and its Oka confluent. Their "march" across Europe has been noted among others by Noll, Maudel, and Greim ("Zoolog. Gart. Frankf." 1864, pp. 30, 89 and 124), Kreglinger ("Verh. ntrw. Verein Karlsr." vol. 1), Merian ("Vehr. ntrf. Ges. Bassel," iv. 1864, p. 94), Morlet ("Journ. de Conch." pp. 309–314, I believe in 1864 or 1866 volume), Von Martens ("Zool. Rec." 1864), Mabille ("Journ. de Conch." xv. pp. 108–110), P. Fischer ("Journ. de Conch." xv. pp. 110–111), Dranitz ("Wurtemberg. naturwiss. Jahreshefte." xxiv. p. 44), Gassies ("Journ. de Conch." xvi. pp. 17–24), Krauss (Jahresh. ver. vaterland. Naturk. Wurth xxiv. p. 44), Martens ("Mal. Blatt." xvi. p. 84), and Siebert (Nachrichts. mal. Gesellsch. I. p. 101). That it was an inhabitant of the old Aralo-Caspian fauna is further enhanced by the fact that Helmersen ("Bull. Ac. Sc. St. Petersburg," 1868, pp. 23–25), has found it extinct north of the Syrdarja river, in the desert of Kara-Kum, which still further proves, as he says, that Lake Aral had a much greater extent in remote times than it has at present.

J. W. WILLIAMS.

N.B.—Since writing the above, I have noticed that several specimens have been placed in the National Collection under its name of *H. Jenkinsi*. This I regard, under the circumstances, as decidedly premature.—J. W. W.

HOW DEEP DO HIBERNATING MOLLUSCS BURROW?

COMPARATIVELY few conchologists, I observe, think it worth while going on their inoffensive war-path in the winter, when their prey is buried torpid in the mud, deep among the roots of trees, or among the foundation stones of walls. Of course, during open weather most land shells are to be found in their usual habitats all through the winter, but I should like to draw attention to the periods when the weather is not open.

Some years ago I made an excursion to the Isle of Man at Christmas time for a fortnight's collecting. All went well for a few days, snails and slugs being almost as numerous as in summer. Then a bitter east wind sprang up one day as I started on a hunt over the Curragh. I had provided myself with a pair of long sea-boots, a sou'wester, a pair of thick gloves, and provisions. I spent the whole day wading through water, which was trying to freeze, scooping vigorously and not unsuccessfully. The gloves were the most troublesome part of the performance, as they continually got wet, so that I had to keep taking them off to put them to dry inside my waistcoat, while I warmed my hands with my pipe. The next day all the swamps were frozen over, so I left the Curragh and went to Port Erin to visit the stone walls. Many of these walls, made of turf and stones, had been very productive on former occasions, but now they were frozen hard. I thought it, however, a good opportunity to see how far snails burrowed during frost; and to that end, by means of a rock, I broke down a considerable part of some walls, which did not seem to be of any particular use, for which I hope the owners have now forgotten and forgiven, especially as I got very little for my pains. I then went into some small woods and dug among the roots of trees, where I was rather more successful. The snow came the next day, covering up my depredations and putting an end to the work on the land. I then turned my attention to the sea and spent a pleasant, though somewhat cold time among the rock pools at low tides, till at last these pools began to freeze, and I had to confess myself beaten.

I own that such an experience does not altogether tend to induce others to do likewise, though it was in fact most enjoyable. My failure with the walls made me consider the question as to how deep the snails go during frost. I had excavated fairly deep and had found hardly any at all. This question has puzzled me ever since, and my object in writing this is to elicit the answer from some one who has been more fortunate or more persevering than myself.

During this last, or rather present winter I have been experimenting to the same end, choosing some uncultivated spots in the limestone district of Derbyshire, (where my excavations could do no harm, being still filled with remorse for my many depredations), in the corners of fields, where heaps of stones overgrown with moss and nettles, and abounding in empty shells of *H. arbustorum* and *H. nemoralis* showed that in summer molluscan life was plentiful. I removed, I suppose, fifteen or twenty such heaps, and found only an occasional adult hibernating, young specimen being far more common perhaps, not having the strength or experience to secure safer quarters. The stones cleared away, I proceeded to dig a foot, sometimes a yard into the soil, and even then found very few, often none at all. This was in open weather after frost.

Now and then I have found an individual, usually an adult, content to hibernate at the bottom of a wall or stone, quite uncovered. Had he been overtaken suddenly by the cold and obliged to secrete his epiphragm forthwith, or did he deliberately choose that spot in defiance of the cold? In the south of England I have often found *H. aspersa* massed in crowds under bricks, potsherds, slates, etc., on the surface of the ground, never below it, except in crevices; but whether that species is hardier than others, or whether instinct has told it that the winter would not be severe, I cannot say. That its size alone does not interfere with burrowing *H. pomatia* proves, nor is its shell so thick as that of the latter. Moreover, *C. elegans* with a shell of remarkable thickness burrows deep.

Similarly with regard to aquatic species—how deep do they burrow? I have scooped away the whole of the mud (of three or four inches in depth) from the bottoms of small ponds and ditches, which in summer swarmed with unios, limnææ, etc., and finding nothing, have come to the conclusion that they burrow below the mud in the subsoil.

This question I hope to settle some day, for a solution must be forthcoming if one only digs and scoops deep enough.

L. E. ADAMS.

ILLUSTRATIONS OF VEGETABLE TERATOLOGY.

THE word "Teratology" is an exceedingly appropriate one, signifying as it does the "Science of Monstrosities." We have seen that modern botany has withdrawn all these "breaks," "sports," etc., from the domain of accident or chance, and included them in the realm of law. Nay, more, as has before been remarked, many, if not all, of these deviations from ordinary morphology may throw light upon the history of orders and genera, if not also of the specific forms of plants.

Fig. 78.—"Monstrous" var. of *Daucas carota*.

Mr. Edward Buckell sends us two capital sketches,

Fig. 79.—"Hen-and-Chickens" Daisy. (Perhaps illustrating the stages of the Cudweeds).

Fig. 80.—Abnormal bract of involucre of Daisy.

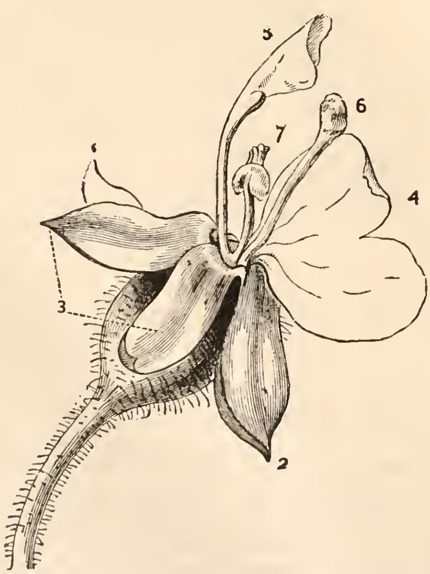


Fig. 81.—Abnormal Enchanter's Nightshade (*Circæa lutetiana*).

Fig. 82.—Abnormal Knapweed.

Fig. 83.—Abnormal Primrose.

one showing an abnormal growth of *Daucus carota* (wild carrot). Perhaps this species is the completest and most typical of the Umbelliferæ. Its secondary umbels are foreshortened into a close and compact head. But it is evident from examples like the accompanying sketch that such was not always the case. Once upon a time each secondary umbel had a long stalk; and in the example before us we may have a return to such an ancestral condition.

Compare this with the not uncommon sport in the field daisy (*Bellis perennis*), known as the "hen and chickens." Perhaps the order Compositæ has undergone a longer and completer series of floral changes than any other. It is interesting to note how the less typical members of this widely-dispersed group differ in so many ways from the most typical, such as the Tubiifloræ, of which the daisy is a good example. May not the "hen-and-chickens" monstrosity be an earlier ancestral type?

In the other illustration of a daisy we have a proof that the bracts of the involucre are only so many modified leaves, for here we notice one of them returning to the leaf-like condition, and assuming much of the character of a daisy leaf.

Mr. Robert Holland has shown that the common knapweed (*Centaurea nigra*) is very liable to produce small abortive flower-heads, in the autumn especially. At other times the scales of the flower-head will return to their primitive leaf condition, as in fig. 82.

In Mr. Buckell's second sketch we have a common primrose with a pedicle. The ordinary primroses spring from the stock root; the oxlip, cowslip, etc., from a common pedicle; whilst the Japanese primrose (*Primula Japonica*) has the pedicle drawn out telescopically a stage higher. This variety of the primrose, therefore, reminds us of the stages through which the well-marked species of oxlips, polyanthuses, etc., have gone through.

In fig. 81 we have magnified an abnormal flower of the deadly nightshade (*Circæa lutetiana*). A portion of the stigma is transformed into the anther of a stamen, whilst one of the stamens assumes partially the character of a petal; and in place of one of the petals we have two distinct sepals. It is not often we get in a single flower such a combined illustration of the probable common origin of all floral organs. The summer is now almost at its meridian, vegetable life is nearing its flood-tide, and our readers will find it enjoyable literally to go into "fresh fields and pastures new," to explore the flowers of the field for "monstrosities." We shall be pleased to put on record all fresh finds, and to figure the most important.

CORRECTIONS.—In the article on "Animals and Medicine," p. 83, col. 2, line 20, for "utilised by man; indeed," read "utilised. Of man, indeed." P. 84, col. 1, line 22, for "gradation" read "*gradatim.*"—*Hulwidgeon.*

A MUD-CAPPED DYKE.

[*Continued from p.* 59.]

By THE REV. HILDERIC FRIEND, F.L.S.

IT is still a gloomy day in December, and we are looking still upon the old stone wall. When the spring comes we shall have an opportunity of observing some new features in connection therewith, but I am anxious that we should first of all try and ascertain whether anything more can be learned from a study of the dyke and its denizens in winter. We turn now from the clay cap and the rough boulders which have been culled from the adjoining fields, and fix our attention on the other objects of interest in the wall.

III. LIFE ON THE WALL.—Just a few blades of grass, a weed or two, and an old, dead flower! What can there be here to interest or instruct us? We will see. I would venture to remind the young student that he will find it far better to begin his intercourse with nature during winter than in summer; for nothing is more disheartening than to find yourself face to face with a hundred different forms of life without a key to their interpretation.

That bit of grass and dead weed may be of great service to us if we will examine them carefully, and master their names and history. We will therefore begin at this northern end of the wall and walk by its side, noting all the vegetable and animal forms, living or dead, which we can identify. How bright, to begin with, is this bit of golden gorse (*Ulex Europæus*, L.), already in flower. What do we know of it? Can we tell what the botanists call the Order to which it belongs? Have we any idea of the number of its stamens, the arrangement of its petals, the way in which it is fertilised, the meaning of the prickles, the shape of the leaves in the seedling, the number and differences in the British species, its distribution, the related families, or its economy in the plant-world? To answer all these questions would take a fairly good botanist a considerable time; yet we pass by the prickly shrub, as it grows on the wall, as a common thing, unworthy our notice, or too well known to be able to teach us. Even now we might find some insect life on the bush, and earlier in the season I saw the little weevil (*Apion Ulicis*), together with a host of flies, bees, spiders, and other things, seeking food and shelter among its blossoms and branches. From this leguminous plant (which by-and-by will have pods in the place of the flowers, reminding us of its close relationship with our peas, beans, and vetches) we turn to that dead weed. It has a little life left, we find on closer inspection, and proves to be a perennial, for a new rosette of leaves is growing already around the bottom of the decaying stem. What is it? The old stalk, the shape of the leaves, and the unattractive smell declare it to be ragwort

(*Senecio Jacobæa*, L.); and there you see, still in bloom, its hardy sister, which, however, is only an annual. Why should one be perennial, the other annual? What is that downy matter peeping through the green scales of the flower-head? Are the scales (involucre) the calyx, as we see in the primrose? And where are the petals? Let us examine the flower for ourselves. We find on inspection that the head is made up of a large number of blossoms; it must therefore be a composite plant. Hence the scales are not the calyx; but that feathery pappus is, and instead of remaining behind when the seed is perfected, it lends itself to the first gladsome breath, and dances gaily away with its burden to seek a new home elsewhere!

Having once begun to notice these things, we soon find that the bare wall is anything but the bald, uninteresting thing we took it to be. Here are the remains of a curious plant (*Galium mollugo*, L.), whose leaves are arranged in whorls around the stem, and concerning which tradition has something to say. It is popularly known as lady's bed-straw, and has been included among the plants which served as a bed for the Virgin during her stay at Bethlehem. That neighbouring plant is called yarrow (*Achillea millefolium*, L.), but ages ago the old Grecians regarded it, or an allied plant, as sacred to Achilles ("Flora Mythologica," p. 211), whence its scientific name, Achillea. We can only mention, in passing, a few of the other plants which are even now to be recognised by the educated eye. Those rosettes of young leaves will bud forth at an early period into plants of whitlow grass (*Draba verna*, L. = *Erophila*), which I never tire of studying; and close by are similar seedlings of hedge mustard (*Sisymbrium thalianum*, Gaud.), and other cruciferous plants. Can we tell why the leaves are thus spread out in a rosette? It is a pretty and instructive device, and if we can find out nothing else we shall be repaid when we discover this. The soft-leaved cranesbill (*Geranium molle*, L.), parsley piert (*Alchemilla arvensis*, L.), autumnal dandelion, plantain and hawk weed, are here also, together with the cocksfoot and other grasses, which in themselves would find us work for many a long hour.

But these higher forms of plant-life are as nothing compared with the host of cryptogams which are clamouring for our notice. To begin with the lichens, we find here that curious form (*Lecidea geographica*), L. Brackel, which has come to be known as the map lichen on account of the peculiar markings of the thallus. Just now heaps of dog's liverwort (*Peltigera canina*, L.) are in splendid fruit about midway along the wall, in a place where the earth has become specially productive; nor must we neglect the common "cup moss," as our country friends usually term another of the lichens (*Cladonia pyxidata*, Fr.). What, however, is this brilliant display which I have just stumbled across? It must be some kind of moss, you say. Yes. It is one of the mosses, but we have just come upon it at the right moment to observe its delicate and elaborate organs of reproduction in their glory. It is only a common moss (*Polytrichum commune*, L.), but we shall find it a delightful object for the microscope, and we will refer to a little work on Plant-Life (by E. Step) for some account of it, if we cannot command a more elaborate work. The twisted moss (*Tortula*), or screw moss as it is often called, the cushion moss (*Grimmia*), and another species (*Hypnum cupressiforme*, L.), are all to be found here; and while their "fruit" is always an interesting study, their cells are no less so; and we may read what Mr. Lett has to say about them in the January issue of the "Journal of Microscopy."

We have not by any means exhausted the list, even of vegetable productions, which I found on this bit of wall one day in December. The Fungi were represented by an agaric, or gilled toadstool, a peziza, with its spores contained in asci or sacs, a parasitic rust which was able to live in the tissues of its host plant very snugly, when many other forms were destroyed by the cold; and other genera. Then there were certain minute Algæ and microscopic forms of life which well deserved attention, but could not be studied on the spot, and are therefore left unnamed.

Hunting thus among the plants, we shall find, even in mid-winter, a considerable number of representatives of the animal kingdom. In the crevices of the wall I gathered a snail (*Helix*), a spider, and a Trombidium; and other creatures were snugly reposing at the foot of the dyke, whose peaceful slumbers I dare not disturb. We will now leave our wall for a time; and in May, if the weather is fair and the season well advanced, we will take a run out, and see what the effect of the winter's snow and the spring's genial breath has been upon our friends.

Carlisle.

JOTTINGS CONCERNING CERTAIN FRUIT TREES.

By Mary B. Morris.

No. VII.—The Walnut Tree.

The common walnut tree, known to botanists as *Juglans regia*, is found growing wild so extensively as to render it difficult to be quite certain of the exact region which can be called its native habitat. In all probability it is a native of the province of Ghitan in Persia, on the shores of the Caspian Sea. It would appear also to be indigenous in Northern China and Japan, in the Northern Himalayas, and in Burmah. Asiatic, we may say, in its origin, it has been a cultivated tree from very early times throughout Asia and Europe. De Candolle states that many species of Juglans existed in the tertiary and upper tertiary epochs, leaves of such having been found in the tufas of the upper tertiary of Provence. At present not more than ten species are recognised. Chinese authors state that the tree came to their country from Thibet from 140 to 150 B.C.

That the Hebrews were amongst its earliest cultivators there can be but little doubt, since their King Solomon, who "spake of trees from the cedar tree that is in Lebanon to the hyssop that springeth out of the wall," writes (Song of Solomon, Cap. VI., v. 11): "I went down into the garden of nuts, to see the fruits of the valley," referring, commentators tell us, to the "walnut."

From Persia it certainly was brought to Greece, and the Greeks, who were wont to say that "in the golden age men lived upon nuts and the gods upon walnuts," knew it by the names of persicon, basilion, and caryon, this last name being said to be derived from the supposed fact that its emanations were very oppressive to the head.

Its introduction amongst the Romans is variously given; by some it is dated as far back as the period of regal supremacy in Rome, whilst others state that it was cultivated by them "before the death of the Emperor Tiberias;" at any rate, they regarded it as of Persian origin. They made use of it in their festivals, especially at marriage ceremonies, regarding it as an emblem of the union of two, from its form, or, as some suppose, on account of its two shells or coverings. Minute accounts of the customs observed at their marriages tell us that, whilst songs were sung at the door of the marriage chamber, the bridegroom stood without and scattered walnuts amongst the young folks assembled, who scrambled for the fruit amidst laughter and merriment.

From Pliny we get some secrets regarding the toilet of Roman ladies. He says: "They used the green shells to dye their wool, but the small nuts just developing were in great demand for giving a red hue to the hair, a tint vastly admired and greatly in fashion with the maidens of the day." As to the matrons, he tells us "they needed it to dye the hair when it has become grey!" The shells burnt and beaten up with oil or wine were used to anoint the heads of infants, having a tendency, it was supposed, to make the hair grow.

Other virtues, too, seem to have been imputed to it: the leaves beaten up with vinegar were accounted a sure cure for earache. Mithridates, King of Pontus, left a recipe in his own handwriting, which, Galen tells us, Marcus Aurelius was wont to use regularly every day. It is as follows: "Take two dried walnuts, two figs, and twenty leaves of rue; pound these together with the addition of a grain of salt. If a person take this mixture fasting, he will be proof against all poisons for that day." Walnut kernels, chewed by a man fasting, and applied to the wound, were said to effect an instantaneous cure of bites inflicted by a mad dog! Much easier this than M. Pasteur's beneficent process!

If all these good effects were believed to flow from the nut, the tree itself was accredited with fully a corresponding amount of mischief. Its shadow was said to be baneful and injurious to man, "in whom it is productive of headache, the emanations from the tree itself penetrating to the very brain;" and it was looked upon as equally noxious to anything growing in its vicinity. It is a well-known fact in the present day that flies are kept away by its presence. Costermongers and others who use donkeys in their daily avocations, frequently in hot weather rub their legs with the juice of walnut leaves, and find it effectual in protecting the poor beasts from the tormenting attacks of flies. A walnut tree planted near the house keeps flies from the rooms whose windows open near to it.

There is no history of the introduction of this tree into Great Britain; some conjecture that it came hither from France, since up to the middle of the sixteenth century they were called "Gaul nuts." The tree does not easily naturalise itself, nor does it spread easily by seeds, as they do not germinate unless in a tolerably warm climate, nor does the tree thrive where subjected to very severe frost.

It appears to have been in general use in Queen Elizabeth's time, since Sir Walter Raleigh, introducing the practice of tobacco smoking, or, as it was then called, tobacco drinking or sucking, set the example of imbibing the fumes by means of a walnut shell and a straw!

Queen Anne of Denmark, Consort of James I., had in her room a "walnut tree chest of drawers;" and in a list of furniture provided for the Princess Elizabeth, daughter of the same monarch, we find included "a folding-table of walnut tree."

Thomas Tusser, in his "Five Hundred Points of Good Husbandry" (1570), repeatedly mentions the walnut tree. In September's "Husbandry" he says:

> "Out; fruit go and gather, but not in the dew,
> With crab and the walnut, for fear of a shrew."

and in January's:

> "Set chestnut and walnut,
> Set filbert and small nut," &c.

Evelyn, writing a century later, gives a voluminous account of the walnut tree. An extract from his "Sylva" may be of interest. He says: "Walnut-juglans, *quasi jovis glans*, the wall or Welch nut, is of several sorts . . . . Burgundy abounds with them, where they stand in the midst of goodly wheat lands, at sixty and one hundred feet distance, and, so far are they from hurting the crop, that they are looked upon as great preservers by keeping the ground warm; nor do the roots hinder the plow. Whenever they fell a tree, which is only when old and decayed, they always place a young one near him; and in several places betwixt Hanau and Frankfort, in Germany, no young farmer whatsoever is permitted to marry a wife till he bring proof that he had planted and is father of such a stated number of walnut trees; and this law is inviolably observed to this day for the extraordinary benefit which this tree affords to the inhabitants. . . . The Bergstrasse (which extends from Heidelberg to Darmstadt) is all planted with walnuts, for so, by another ancient law, the Borderers were obliged to nurse up and take care of them, and that chiefly for their ornament or shade, which some have causelessly defamed for its ill effect on the head." He then recounts the universal use of the timber on the Continent and in England. He says: "It is of singular account with the joiner for the best grained and coloured wainscot; with the gunsmith for stocks; the coachmaker for wheels and bodies of coaches. In New England they make of it hoops and bows for want of yew; the drum-maker uses it for rims, the cabinet-maker for inlayings. . . . To render this wood better coloured, joiners put the boards into an oven after the batch is forth, or lay them in a warm stable, and, when they work it, polish it over with its own oil very hot, which makes it look black and sleek, and the older it is the more estimable. The fruit it is thought better to cudgel off the tree when dropping ripe, than to gather it by hand. In Italy they arm the tops of long poles with nails and iron for the purpose, and believe the beating improves the tree, which I no more believe than that discipline would reform a shrew." . . . As to the utility of the fruit, "It makes food and oil, this last of extraordinary use with the painter in whites and other delicate colours, also for gold size and varnish. They fry with it in some places, and eat it instead of butter in Barry, where they have little or none good, and therefore they plant an infinite number of trees all over that country. The use of it to burn in lamps is common there. In Italy, when a countryman finds any pain in his side, he drinks a pint of the fresh oil, and finds immediate ease."

An entry in Evelyn's Diary, dated 1662, recounts a visit to Sir Josiah Child's at Wanstead House, "to see the prodigious cost in planting walnut trees about his seat."

Nor are the uses to which wood and fruit are alike put, less in our own day. The wood used by cabinet-makers, joiners, coachmakers and musical instrument makers is preferred by them when grown on a poor, hilly soil. It is much esteemed for gun-stocks, but the wood for this purpose is imported from the Black Sea, and that of the black walnut (*Juglans nigra*) from North America, so that the cultivation of the tree for its timber has almost ceased in England.

The fruit is used for table in almost every stage of its growth. Young, green and tender (so long as a pin will pierce it to the heart) it is good for pickling, husk, nut and all; after this stage some pickle the green husks alone; when half ripe a liqueur is distilled from the nuts. In August, before they are quite ripe, the French eat them *en cerneaux*. They scoop out the kernel with a knife, and eat it with vinegar and pepper and shallots; and we all are acquainted with the ripe nut as we get it in September and October fresh and sweet, a fruit which, in common with most nuts, is very wholesome and nutritious so long as it is fresh and easily parts with its skin, but when it has become dry is oily and indigestible; in fact, in its fresh state it is a very important and staple article of diet in many parts of Italy, France, Spain and Germany, and in Switzerland, where the villagers hold festivals to celebrate its in-gathering. The fruit is still almost universally gathered by thrashing (or, as Evelyn has it, cudgelling) the trees with a long pole, but whether merely because it is the easiest way of reaching the fruit, or on account of the supposed benefit to the tree, is hard to say; in all probability the reduction of excessive growth, accomplished by this rough method of pruning, may lead to better fruiting in many cases. The walnut contains a large quantity of oil, which is much used on the Continent. It is obtained by reducing the nuts to a pulp by means of a stone wheel, and then expressing the oil, cold first, then by the application of heat. That obtained cold only, is used as an article of diet, and is said to be nicer in salad than olive oil, and to keep well; to some tastes, however, the flavour of the walnut, which always remains, is objectionable. The oil obtained by heat is used by artists and also for lamps. Artists prefer it for mixing white and delicate colours, on account of the rapidity with which it dries. It is in great demand in Paris by copper-plate printers, who say that ink made with other oil cannot be relied upon to produce a fine impression; for this use the oil is brought to the required consistency by boiling, and then setting fire to it and burning it in a close vessel. About seven pounds of this oil can be obtained from a bushel of nuts. The refuse left after extracting the oil from the nuts is made into cakes, and used as food for pigs, sheep, and poultry, and in some places into candles, which give a tolerable amount of light. The husks and the root of the walnut both yield a dye, which is used for staining the skin by gipsies and others, as well as by cabinet-makers for staining white and light woods, to give them the colour of walnut wood. The husks must be allowed to decay, and then be boiled in water sufficient to make the decoction of the desired hue.

A large quantity of saccharine matter is contained in the sap of the trees, which in some countries, before the extensive use of beetroot, were tapped for the purpose of obtaining the sap, which by boiling was evaporated and thus converted into sugar. In many parts both of Europe and Asia this sap is distilled and a spirit made from it, or it is fermented and becomes wine.

Nor do the leaves of the tree lack useful properties.

They contain a large proportion of alkali, and in France are collected and burnt for the sake of the potash contained in the ashes. The bark, husks, leaves and oil of the walnut have all been used in medicine, and at one time were held in great repute, possessing a bitter principle, which had its value as a tonic. One other use has been made of an infusion of the leaves or husks—anglers pour it upon the ground to induce earthworms to come to the surface, that they may secure the needful bait. The virtues of the walnut tree have been summed up by an old author in these lines :

"On barren scalps she makes fresh honours grow,
Her timber is for various uses good:
The carver she supplies with wood;
She makes the painter's fading colours last;
A table she affords us, and repast.
E'en while we feast, her oil our lamp supplies;
The rankest poison by her virtue dies;
The mad dog's foam, and taint of raging skies,
The Pontic King, who lived where poisons grew,
Skilful in antidotes, her virtues knew."

SCIENCE-GOSSIP.

We have received reprints of Mr. Barr Frere's delightful and suggestive papers published in the "American Naturalist," entitled, "Sociological Influences," and "Climatic Influences," in their bearing upon primitive architecture.

The last number of the "Proceedings of the Geologists' Association" contains a most valuable paper (well illustrated) by A. Smith Woodward, entitled, "A Synopsis of the Fossil Fishes of the English Lower Oolites.

The Rev. Dr. Hind, of Honington Rectory, Bury St. Edmunds, author of the splendid recently-published "Flora of Suffolk," has presented his fine herbarium of Suffolk plants, made in connection with the work, to the Ipswich Museum, in trust for the use of the public. Dr. Hind had previously presented a fine herbarium of British plants to his *alma mater*, Dublin University.

We are deeply sorry to have to chronicle the death of an ardent and painstaking geologist, a frequent contributor to our columns, Mr. S. A. Adamson, F.G.S., of Leeds.

Those botanists who can afford the time ought not to lose the opportunity of seeing Mr. William Bull's magnificent exhibition of new, rare, and beautiful orchids, now in bloom at 536 King's Road, Chelsea.

In the course of the excavations for the Manchester Ship Canal, "pot-holes," resembling those seen in the well-known "Glacier Garden" at Lucerne, have been discovered.

The Twentieth Annual Report of the Wellington College Natural History Society is to hand. This is one of the most admirably managed of all our School Societies. The Report gives a pretty full account of the excursions, papers read, &c., as well as special "Reports" on Phenological Phenomena, Meteorology, Entomology, Zoology, Ethnology, Photography, &c.

The last number of "The Essex Naturalist" contains in full the admirable address of the President of the Essex Field Club, Mr. E. A. Fitch, F.L.S., on "Bird Migrations."

Part 8 (vol. v.) of the "Transactions of the Hertfordshire Natural History Society" is devoted to short accounts of the proceedings, reports of field meetings, the library balance-sheets, &c.

The monthly leaflets issued by the Huddersfield Natural History Society, giving short accounts of meetings, papers, &c., are both highly interesting and very useful. The idea is worth copying by other societies, as it entails little expense.

The First Annual Meeting of the Museums Association will be held in Liverpool on June 17th, 18th, and 19th—the Rev. H. H. Higgins, President.

The Birmingham Naturalists' Publishing Company are issuing a series of cheap twopenny paper-covered pamphlets or handbooks of great service to young beginners. They deal with the collecting and preservation of freshwater Algæ, birds, birds' nests and eggs, flowering plants and ferns, land and freshwater shells, and dragon-flies.

A capital portrait of the veteran geologist, Mr. William Pengelly, F.R.S., of Torquay, appears in the May number of "Research," accompanied by a memoir.

A very interesting and highly readable natural history and popular scientific paper has just appeared in Portland, Conn., under the title of "The Observer."

We have received the first part of a new scientific monthly, published by Messrs. W. H. Allen & Co., entitled "The Entomologists' Record."

MICROSCOPY.

The Royal Microscopical Society. — The April number of the Journal, in addition to the welcome and succinct "Summary of Researches" in all things histological, botanical and zoological, contains the full text of Dr. Hudson's delightful Presidential Address on "Some Needless Difficulties in the Study of Natural History"; and a paper by Mr. A. D. Michael, "On the Variations of the Female

Reproductive Organs, especially the Vestibule, in Different Species of Uropoda."

Photo-micrography.—I am obliged to Mr. Roland Whiting for pointing out my mistake in using the term "micro-photography" instead of photo-micrography." Regarding the rigidity of the apparatus, the fact that I can use it on board ship and at sea will testify to that.—*David Wilson Barker*.

Cleaning Objectives in India.—Having used the microscope for more than a dozen years in India, and coming frequently in contact with other workers with the instrument, I have a suggestion to make which will, I trust, catch the eye of our leading opticians. Books and catalogues recommend us to send our objectives to their makers when they need cleaning—advice which I have generally disregarded! It can be followed in England, but not out here. Some objectives admit of being taken to pieces; others, unfortunately—and these of English make—do not. I have to suggest that all objectives to be used in India should be so put together as to enable their possessors to take them to pieces readily, without injuring the heads of small screws, &c. The expense, delay and risk incidental to sending them to London for such a simple matter, are distinct drawbacks to their use.—*W. J. Simmons*.

ZOOLOGY.

Feeding Trout.—I shall be greatly obliged if any of the readers of Science-Gossip can tell me of an efficient, as well as cheap means of feeding the young of trout when in the nursery. If any individuals or natural food of the young of trout can be propagated in the water of the nursery of this fish in sufficient quantities as to be of any material use in the feeding of them.—*Clara Kingsford*, 14, *St. Dunstan's Terrace, Canterbury*.

Paludina Vivipara Var. Inflata, *Loc.*—I do not quite understand the gist of Mr. Fryer's note on p. 94 *ante*, wherein he makes reference to me, and asks for a recognition on my part of his statement with regard to *P. vivipara var. inflata*. His note, it appears to me, is not pertinent, since what records I made of North London shells were concerning my own personal "takings," and did not refer to "finds" made by any one else. What he wishes me to admit seems no other than this: that while he has found "forms" of *P. vivipara* in the "Leg of Mutton" pond on the Heath, which he personally considers referable to the var. *inflata* of Locard, I have been unable to satisfy myself in that respect with the various "forms" which have been taken by me from the same locality. This I am quite ready to admit, and I am as equally ready to admit that, whether the forms belong to Locard's *inflata* or not depends entirely on the "personal equation" of the recorder. Other than this, the question is one of a disinteresting nature.—*J. W. Williams*.

New Method of Preparing Lantern Slides.—Dr. Sorby, F.R.S., recently gave a demonstration of his new method of preparing specimens for exhibition by the lantern. On the whole, his method consists in drying specimens on glass, and in some cases in subsequently mounting them in Canada balsam. As an illustration, some cases may be described. Taking such a beautiful Nudibranch as Eolis, it may be first washed in a mixture of equal parts of alcohol and water, then properly arranged on the glass, and allowed to dry. Success depends to a great extent on the fact that the edges dry first, and adhere to the glass in such a manner that the subsequent drying reduces only the thickness of the object; and when dry the original outline is perfect, and the animal seems as if it were a projection on the plane of the glass. When subsequently mounted in balsam and used as a lantern slide, the natural form and colour are seen on the screen like a beautiful picture. Such Chætopoda as Niveis are easily prepared, and when thrown on the screen, not only the general form but every hair and the chief blood-vessels are visible, though some of the latter are too small to be well seen unless the real object is examined with a low magnifying power as a hand specimen. Strange to say, such very unpromising animals as Medusa give most satisfactory results. They must first be deposited for a considerable time in diluted alcohol, to remove the salt, then stained with Keinberg's hæmatoxolin or Beale's carmine, and finally dried on glass and mounted in balsam. When thrown on the screen the most important points in their structure are well seen. The fringe of tentacles and the sub-umbrella stain dark, whilst the canal system is beautifully shown dark on a pale background. It would be difficult to artificially paint a diagram showing the structure better than does the real animal thus prepared. Such preparations as those named above are equally satisfactory as museum or cabinet specimens, as they take up less room than bottles, do not lose their colour, and can be easily examined in the hand with low magnifying power.

Spinning Habits of Cyclas Cornea.—In Dr. Jeffrey's "British Conchology," p. 15, vol. i., there appears an extract from a letter received from Dr. Lukis, of Guernsey, referring to the habits of the Sphæriidæ. In speaking of corneum as a thread-spinner Dr. Lukis says, "*Cyclas cornea* is much less active or inclined to ascend the glass; in fact, I have not seen it accomplish the feat." I have for some short time kept a number of this species, and have found it quite the reverse of the above one specimen, which

I noted carefully spun in the space of four hours three distinct threads from two and a half to three inches in length; another spun two about three inches long in about two hours and a half. Dr. Lukis states that it took *S. lacustre* three hours to spin a thread one inch in length. This statement cannot apply generally to the *Sphæridæ*, as I have at least a dozen separate observations recording threads of two and a half to four inches, none of which took more than seven hours to spin.—*W. E. Collinge.*

BOTANY.

"MONSTROUS" HYACINTHS.—In your March issue Mr. H. I. Perrett wants to know if monstrosities in hyacinths are common. My only reply is this, that if he wants monstrosities he has only to buy a quantity of hyacinths and watch their growth carefully. Last year one of my hyacinths branched into two stems at the apex of the stalk, the length of stalk being $3\frac{1}{2}$ inches to 4 inches. This year, having a greater quantity of them, the monstrosities are also more numerous — one hyacinth with nine racemes. It is usual with hyacinths that the florets at base should open first (indefinite inflorescence), but with one of them the florets at apex opened first and the lower ones last (definite inflorescence), which gave the flower a stunted appearance; and other monstrosities could be stated. Some of my hyacinths have had two ovaries and two distinct styles (botanically six), and numerous stamens, as I did not count them. In the order *Liliaceæ* there are six stamens, to which order the hyacinth belongs. The only cause of these monstrosities, from what I have been able to make out, is too vigorous a growth at any particular part. Mr. Perrett wants to know if it will appear again next year. To this I say no, as all the vigour of the bulb has been expended on this year's flowering, and if it flowers at all it will be a very weakly one, especially having been grown in water. If it had been grown in soil, with proper treatment, perhaps he would be able to have a medium-sized flower, as the flower-bud is formed in the bulb the year previous to its flowering, and so a great deal depends on before-treatment as well as after-treatment; and in the case of a hyacinth grown in water, it has not the chance of building up the material it has expended at flowering time.—*Elia G. Abdela.*

THE ELECTRIC LIGHT AND VEGETATION.—The influence of the electric light on vegetation has manifested itself in a remarkable manner in the case of the large lime trees on the Leipziger Platz, Berlin. On the branches of these trees which are opposite the electric light, a few days ago, the development of the new leaves had advanced considerably, whereas on the other side, where the light does not strike upon the branches, the buds were only just beginning to form. On one of the trees the difference is very marked indeed.—*H. Hayward.*

GAGEA LUTEA.—This plant has been found at Sitton (Dorset), the next parish to this. Hooker names it as "local and rare"; J. C. Mansell-Pleydell, in his "Flora of Dorsetshire," as very rare. He records one locality for Dorset, and gives Somerset and Wilts and Normandy as other counties where recorded. Preston, "The Flowering Plants of Wiltshire," under name *G. fasicularis*, gives two localities. The plant was in flower this year on the 13th of March at Sitton. I should be glad to hear if any botanist has found *G. lutea* in the Mere district of the county of Wilts.—*Rev. Charles F. W. T. Williams, Zeals, Bath.*

"ILLUSTRATIONS OF VEGETABLE TERATOLOGY."—I do not know whether the following may be strange enough to be noteworthy. The other day in peeling an orange I noticed that its skin (a very thin one) was irregularly covered with hard mound-like projections. On cutting through one of these I found it filled with a tough substance of the consistency of glue, but quite tasteless—at least, to my palate. It resembled crude turpentine in appearance, and such I dare say it actually was. The masses were about the size of split peas, and were lodged between the pith and rind of the peel, swelling it to more than twice its size elsewhere. There were upwards of a dozen of them in all. The orange itself was fairly sweet and juicy, but its partition membranes were "leathery." I have saved some of the knobs.—*Hulwidgeon.*

GEOLOGY, &c.

THE ORIGIN OF THE BASINS OF THE GREAT LAKES OF AMERICA.—At a recent meeting of the Geological Society an interesting paper on this subject was read by Professor J. W. Spencer, F.G.S., State Geologist of Georgia. From the study of the hydrography of the American lakes, from the discovery of buried channels revealed by borings, from the inspection of the glaciation of the lake-region, the consideration of the late high continental elevation, and the investigation of the deformation of old water-levels, as recorded in the high-level beaches, the explanation of the origin of the basins of the Great Lakes becomes possible. The original Erie valley drained into the extreme western end of Lake Ontario—the Niagara river being modern—by a channel now partly buried beneath drift. Lake Huron, by way of Georgian Bay, was a valley continuous with that of Lake Ontario; but between these two bodies of water, for a distance of about ninety-five miles, it is now buried beneath hundreds of feet of drift. The old channel of this buried valley entered the Ontario basin about twenty miles east of Toronto. The northern part of Lake Michigan basin was drained into the Huron basin, as at present; whilst the southern basin of that lake emptied by a now deeply drift-filled channel into the south-western part of Huron. The buried fragments of a great ancient valley and river, and its tributaries, are connected with submerged channels in Lake Huron and Lake Ontario, thus forming the course of the ancient St. Lawrence (Laurentian) river, with a great tributary from the Erie basin, and another across the southern part of the State of Michigan. This valley is of high antiquity, and was formed during times of high continental elevation, culminating not long before the Pleistocene period. The glaciation of the region is nowhere parallel with the escarpments, forming the sides of, or crossing the lakes or less prominent features. During the Pleistocene period, and especially at the close of the episode of the upper Till, the continent was greatly depressed, and extensive beaches and shore-lines were made, which are now preserved at high elevations. With the re-elevation of the continent these old water-levels have been deformed, owing to their unequal elevations. This deformation is sufficient to account for the rocky barriers at the outlets of the lakes. Some of the lakes have been formed, in part, by drift obstructing the old valley. The origin of the basins of the Great Lakes may be stated as the valley (of erosion) of the ancient St. Lawrence River and its tributaries, obstructed during, and particularly at the close of the Pleistocene period, by terrestrial movements, warping the earth's crust into barriers, thus producing lake-basins, some of which had just been formed in part by drift deposited in the ancient valley.

Professor Rucker's New "Divining Rod."—We have heard a good deal concerning the divining rod being used for finding underground supplies of water. The trick is a very ancient one, and lost nothing of its cleverness by being handed down for generations from father to son. The divining rod could find out where copper, tin, lead, zinc, or other metals lay buried below the surface of the earth, as well as discover water. The only thing that led to scepticism was that it professed to find too much. But, after all, the divining rod, made of a twig of hazel with a forked end, was perhaps the rude predecessor of the scientific instrument which Professor Rucker has just made known to the Royal Society; just as the rough Palæolithic flint implement was the antecedent of the modern surgeon's lancet and the cavalry sword. Briefly, Professor Rucker's magnetometer is an adaptation of the well-known magnetic compass. It indicates the occurrence of subterranean strata lying beneath those which appear on the surface, if they are magnetic or contain much iron, as basaltic and many other igneous rocks do. Consequently, although this simple instrument cannot tell us if coal occurs deep down beneath, it can pronounce where it does not. In the important paper on "Coal in South-Eastern England," read by Mr. William Whitaker before the Society of Arts on April 23rd, Mr. Whitaker had occasion to refer to Professor Rucker's recent discovery, and after the paper was read Professor Rucker joined in the discussion. Professor Rucker and Professor Thorpe (of Leeds) have for some time past been noting the behaviour of the magnetic needle in various parts of Great Britain, and they found that it frequently misbehaves; in other words, it is deflected in certain places from what would be regarded as its proper direction. The explanation is that the deflection is due to great masses of iron-bearing rocks, such as basalt, even when they are buried up beneath chalk and tertiary strata. Thus the new instrument has been the means of demonstrating hitherto unsuspected relations between the magnetic properties and geological characters of various districts. Professors Rucker and Thorpe have in this way proved that there was magnetic attraction along certain definite lines which run across England. One is from the Lynn Wash to the line of the Midland Railway between Hawes and Settle (in Yorkshire), a distance of one hundred and fifty miles. They further stated, with confidence, that a line from somewhere near the South of the Thames, running through the South Wales coal-field, was a line to which the magnet was attracted, especially near Reading. Professor Rucker is of opinion that the needle is affected by the direct magnetic properties of the underlying rocks, and this can only happen where iron is present in considerable quantities. How delicately the magnetic needle stands in relation to the iron-bearing underground rocks beneath any surface, is proved by the fact that considerable effects might be produced upon it by rocks lying six or seven thousand feet below. Where such iron-bearing rocks are indicated to come up nearest the surface, coal can hardly be expected to be found; and, further, in those localities where the underlying rocks come nearest the surface, the downward pull on the magnetic needle was found to be very great.

NOTES AND QUERIES.

Seasonable Notes.—April 1, swallow seen; April 2, *Viola tricolor* in flower; April 3, *Glechoma hederacea* in flower—queen wasp seen; April 6, hedge-sparrow's nest with four eggs; April 9, *Stellaria holostea* in flower; April 11, *Plantago lanceolata* in flower, and crow-parsley; April 12, sea-pink anneria in flower; April 14, *Pedicularis sylvatica* in flower—larch in flower—blue-bell in flower; April 16, *Cardamine pratensis*, dove's foot, cranebill, yellow pimpernell, and wild cherry in flower; April 17, *Orchis mascula* in flower; April 22, sycamore and *Vicia sepium* in flower—sand-martins seen; April 23, *Veronica chamædrys* in flower; April 24, *Orobus tuberosus* and wood-sanicle in flower—cuckoo heard;

April 25, *Ranunculus auricomus* and pignut in flower—oak in leaf—wild arum in flower; April 26, "milkwort" and "hawthorn" in flower—corncrake heard; April 28, "London pride," "*Potentilla anserina*," and "*Trifolium minus*" in flower; April 30, beech, rowan-tree, Wych elm and lime in leaf; May 1, orange-tip butterfly seen; May 3, "*Potentilla tormentilla*," "*Ajuga reptans*," *Carduus lanceolatus*, and *Ranunculus acris* in flower.—Erratum: In May No., p. 119, the words "and laurel," under date March 14, should be deleted.—*Rev. S. A. Brenan, Cushendun, co. Antrim.*

The Variation in the Colour of Birds' Eggs.—In 1883 I found, near Maidstone, a nest of the nightingale (*Philomela luscinia*), with five eggs in it. There was a gradual variation of colour on each egg, forming five distinct tints, and varying from a light blue, very slightly coloured with brown, to a perfect light-brown; the intermediate colours consisted of tints of bluish-brown. The eggs with the two extreme colours I have in my collection; the other three I left in the nest, for I only take those eggs which vary considerably from the ordinary type. If "clutch"-taking increases, it will be well for naturalists, especially ornithologists, to have certain nests and their contents included under the "Wild Birds' Preservation Act."—*E. T. B.*

Fungoid Growth on Limax agrestis.—Whilst out collecting at Newlay, near Leeds, I met with two specimens of *L. agrestis* which were covered with a fine fluffy fungoid growth. Both specimens seemed to be somewhat shrivelled, but otherwise were perfectly normal. Is not this an unusual occurrence?—*W. E. Collinge, Springfield Place, Leeds.*

Snow Bunting in Worcestershire.—I notice in last month's Science-Gossip is a notice of the nesting of the Snow Bunting in Worcestershire. This must be an error, I think. Who has seen the eggs? Only one or two authentic records (from extreme northerly points) of this bird breeding in Britain are in existence.—*H. W. M.*

Monster Purple Orchis.—It may interest some of your readers to know of a monster purple Orchis I found last year. The flower-head alone was ten inches, the whole growth out of the ground two feet, number of flowers on spike about 45 to 50. I made an exact sketch of it, which I should be happy to send if it would be of any interest.—*Marion Crowley.*

The Redstart.—On February 17th, 1887, a neighbour of mine set a trap to catch some birds; there was rather a deep snow on the ground at the time. He caught several birds, and among them was a redstart (*Ruticilla phœnicura*). On the 20th February this year my neighbour called me to see another redstart. Is it unusual to see redstarts in midwinter? They are said to leave in autumn and return about the 15th April. The bird caught is stuffed.—*H. Blaby.*

Curiosity of a Hedge-Sparrow.—This year a pair of hedge-sparrows made their nest in some pea-sticks standing in a corner in my garden, and as I wanted to move them I told my boy he should have the eggs when the whole of them were laid, which was on April 23rd. The eggs were taken, and I put a dead chaffinch on the nest I happened to have, and concealed myself in a shed close by, where I could see the nest, and waited the result. I expected to see a commotion when the hedge-sparrow came back to her nest, but I was disappointed. She hopped to the nest, and after some sidling of the head and shuffling of the wings, the sparrow hopped on the nest and sat on the dead chaffinch, and continued to sit for four days. By that time the nest was quite offensive, the chaffinch being nearly rotten. I thought this very singular, and that it might perhaps be interesting to some of the readers of Science-Gossip.—*H. Blaby.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

T. Rogers (Manchester).—Science-Gossip is usually published about the twenty-sixth of the month. You had better get your copies direct from the publishers.

EXCHANGES.

Offers wanted for works on conchology, and "The Microscope."—M., 56 Clarendon Villas, West Brighton.

Barbadoes earth, very rich, offered in exchange for mounted specimens illustrating physiology of plants, with description.—J. H. Hart, F.L.S., Botanic Gardens, Trinidad.

Offered, for good cabinet specimen each, barite, fluor spar, labradorite, hypersthene, pyroxene, andesite and serpentine, or good series small ammonites for polishing, fifty varieties South Australian marine shells, including sp. chione, dosinia, modiola, voluta, cypræa, &c.—E. H. Matthews, Post and Telegraph Station, Yorke Town, South Australia.

Duplicates.—British land, freshwater, and marine shells, also birds' eggs and British Lepidoptera. Desiderata, Continental, American, or Australian specimens. Continental correspondents can apply in French, German, or Italian.—William Hewett, 6 Howard Street, Fulford Road, York.

Wanted, *Helix pomatia, cartusiana*, alive; also *Clausilia biplicata* and *Rolphii*, or any foreign land or freshwater shells. Offered, *P. ringens, umbilicata, secale; Zonities excavatus, glaber, purus*, and var. *margaritacea, Z. fulvus*, and other land and freshwater shells; also many marine species wanted European correspondents desired.—Fred. Rhodes, M.C.S., 26 East View, Eccleshill, near Bradford, Yorks.

Wanted, shells from the Mediterranean and Red Sea. Offered, auriferous quartz, native gold in quartz, quartz, var. rock crystal, river deposit, silver ore, &c., all from Nova Scotia.—W. Jones, jun., 27 Mayton Street, London, N.

What offers for Bower's "Practical Botany," Vines' "Physiology of Plants," and Schützenberger's "Fermentation"? Excellent condition.—Hon. C. Leigh, 3 South Place, Knightsbridge.

Transverse section of fossil coral, *Cyathophyllum dianthus* and *Porites petalliformis*, longitudinal section of *C. dianthus* and *Orthis canalis*. Desiderata, glass top or bottom boxes, marine foraminifera, star-fish, or any good mounting material. No diatoms wanted.—H. Durrant, 4 Boulton Road, West Bromwich.

Slides of "Challenger," and other choice foraminifera, for good foraminiferous material.—J. Ford, Wickham Lodge, Kew.

Wanted, Continental and foreign hydrobiæ. British land and freshwater shells and hydrobiæ offered in exchange.—A. J. Jenkins, 6 Douglas Terrace, Douglas Street, Deptford, S.E.

WANTED, *Pisidium roseum*, *Succinea oblonga* and *virescens*, *Zonites purus*, *Helix lamellata*, *villora*, and *pygmea*, *Bulimus montanus*, *Pupa ringens*, several vertigos, *Acme lineata*, and numbers of varieties. Offered, N. American land and foreign marine shells. — Thomas Reader, 171 Hemingford Road, London, N.

FIFTY well-mounted micro-slides, in exchange for suitable books on natural history; good value given.—W. Sim, Gourdas, Fyvie, Aberdeenshire.

SMALL glass-top boxes, and well-mounted slides of rock and diatomaceæ; mutual exchange offered in shells, fossils, &c.—T. E. Sclater, jun., Bank Street, Teignmouth.

WANTED, a 2-inch objective. Will give liberal exchange of foraminifera representative of "Challenger" report, mostly rare specimens, or eupleclilla if preferred.—W. H. Harris, 44 Partridge Road, Cardiff.

WANTED, Blackwall's "Spiders," and monographs of any groups of animals or plants with good coloured plates of all the species; also Lee's "W. Yorks. Flora." Will give copies of my "British Birds" (col. plates), British Lepidoptera," &c.—S. L. Mosley, Beaumont Park, Huddersfield.

WANTED, *Physa hypnorum*, *Physa fontinalis*, *Bythinia tentaculata*, *Valvata piscinalis*, *Planorbis complanatus*, *Zonites purus*, *H. concinna*, *H. fusca*, *H. pygmæa*, *Pupa ringens*, *P. marginata*, *Vert. antivertigo*, *Vert. pygmæa*, *Vertigo edentula*.—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

WANTED, Adam's "Collector's Manual of British Land and Freshwater Shells" (col. plates), or Rimmer's "British Land and Freshwater Shells." Offered, SCIENCE-GOSSIP for 1888 and 1889, unbound.—James B. Beckett, 11 Lancaster Road, Great Yarmouth.

WANTED, hydra, amœba, or chara, in exchange for water-snails and newts.—R. F., Lurgan House, East Molesey, Surrey.

WANTED, *Clausilia Rolphii*, *C. laminata*, *C. biplicate*, *Hydrobia ventricosa*, *H. similis*, and *H. ulvæ*, in exchange for land, freshwater, and marine shells. Also wanted, foreign clausilia.—Chas. Pannell, jun., East Street, Haslemere.

SCIENCE-GOSSIP for 1887, unbound. Will send free for a Jubilee sixpence, first issue.—W. Mathie, 127 Buchanan Street, Glasgow.

DUPLICATES.—*S. corneum*, *A. anatina*, *N. fluviatilis*, *B. tentaculata*, *B. Leachii*, *V. piscinalis*, *V. cristata*, *P. spirolis*, *P. vortex*, *P. carinatus*, *P. corneus*, *L. glutinosa*, *L. truncatula*, *H. rufescens*, *H. caperata*, *H. ericetorum*, *C. rugosa-Hydrobia ulva*, *H. ventrosa*. Desiderata, shells or other natural history specimens.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

CONCHOLOGY.—Will any one oblige me with the following? *Trochus granulatus*, *T. alabastrum*, *Lyonsia Norvegica*, *Thracia distorta*, *Diodonta fragilis*, *Isocardia cor*, *Lucina leucoma*, *Avicula hirundo*, *Lima hians*, *L. loscombii*, *Pecten nivea*, *P. andounii*, *P. furtivuus*, *Terebratula caput-serpentis* (large), *Puncturella noachina*, *Buccinum acuminata*, *B. fusiforme*, *Mangelia striolata*, *Spirula peronii*, *Pholadidea papyracea*, *Scalaria trevellyana*, *Fusus turtoni*, and *Limnæa involuta*, wanted in exchange for other rare shells, as *Scalaria clathratula*, fine odostomias, *Lacuna crassior*, *L. vincta*, *L. puteolus*, *L. pallidula* (yellow type), *Aclis unica*, *Rissoa Zetlandica*, *R. cancellata*, *R. striatula*, *R. cingillus*, *R. cimicoides*, *R. calathus*, *R. reticulata*, *R. fulgida*, *Adeorbis subcarinatus*, *Ianthina Britannica*, *Eulima polita*, *E. distorta* and *bilineata*; also fossils and finely-cut and polished geological cabinet specimens.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

WANTED, good unmounted material, also foreign butterflies and shells, or anything interesting, in exchange for choice microscopic slides, anatomical, double-stained botanical, diatoms, parasites, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

WANTED, live sea anemones, &c., for an aquarium, also vol. ii. of Claus and Sedgwick's "Text-book of Zoology," for which good exchange will be given.—H. W. Parritt, 103 Camden Street, N.W.

FORAMINIFERA.—Wanted, mounted or unmounted specimens of nodosaria, rotulina, dentalina, rotalia, fossil or recent. Offered, mounted diatoms, and foraminiferal material from miocene beds.—J. H. C., Ashfield House, Malta.

WANTED, "Carpenter on the Study of the Foraminifera," and any other pamphlets relating to the same subject.—J. H. C., Ashfield House, Malta.

PHYSIOLOGICAL.—For exchange, professionally made slides, including spleen, liver, &c., all human. Wanted, mounted foramens, or pamphlets relating to the same.—J. H. C., Ashfield House, Malta.

WANTED, D'Orbigny's "Foraminifères fossiles du bassin tertiaire de Vienne" (Autriche), découv. par J. de Haur, Paris, 21 plates.—J. H. C., Ashfield House, Malta.

B. Goodalii, *P. nitidum*, *U. margaritifer*, &c., in exchange for *B. montanus* and *obscurus*, *C. tridens*, var. *crystallina*, *P. ringens*, or *succineas*, from localities not represented in collection.—R. Standen, 40 Palmerston Street, Moss Side, Manchester.

WHAT offers for "Hanover on the Construction of the Microscope," translated by Goodsir? Other books for exchange, chiefly educational. Wanted, micro-slides, foraminiferous material, books, &c.—A. Earland, 3 Eton Grove, Lee, S.E.

WANTED, eggs of cuckoo, corncrake, phalarope, snipe, dunlin, whimbrel, golden plover, ptarmigan, snow bunting, kestrel, heron, and many others. Send particulars and wants to—W. Wells-Bladen, Stone, Staffordshire.

Pecten opercularis wanted, about twelve specimens, full grown. Shells of the following are offered in exchange: *Helix virgata*, var. *major*, *leucozona*, *submaritima*; *Helix caperata*, var. *ornata*; *Helix rufescens*, var. *albida*; *Succinea elegans*, var. *ochracea*; *Helix pulchella*, *Helix concinna*, *Bythinia Leachii*, *Zonites glaber*, *Planorbis dilatatus*, &c.—T. Rogers, 27 Oldham Road, Manchester.

WANTED, foraminiferous material, dredged or otherwise, from any tropical localities. Gatherings particularly desired from any of the following places: Jamaica, Bermuda, Ceylon, Java, Madagascar, Macassar, and Philippine Islands. Good exchange in micro-slides, professional mounts, or state requirements. Material which has been already examined not objected to.—W. W. Jacobs, Florence Villa, Coventry Road, Ilford.

WANTED, N. American plants, also rare or local species of the larger British genera, especially rubus, rosa, and carex, in exchange for rare and local South of Ireland species.—R. A. Phillips, Ashburton, Cork.

WANTED, *Pisidium roseum*, foreign clausilias, varieties of British land and freshwater shells, especially albinoes: also *Helix pomatia*, *H. pisana*, and vars. of *Helix arbustorum*, living mature shells. Rare British land and Freshwater shells in return.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorks.

FOREIGN butterflies. Many fine and rare species in duplicate (particularly papilios), too numerous to specify; also wings of *Urania fulgens* and *Morpho menelaus*, splendid for microscope.—Hudson, Railway Terrace, Cross Lane, Manchester.

FINE Wallasey *Deilephila galii*, bred, and the local bee, *Colletes cunicularia*. Desiderata numerous.—Chas. H. H. Walker, 12 Church Street, Liverpool.

BOOKS, ETC., RECEIVED.

"Studies in Evolution and Biology," by Mrs. Alice Bodington (London: Elliot Stock).—"Handbook of Descriptive and Practical Astronomy," by G. F. Chambers, F.R.A.S., vols. i. and ii. (Oxford: Clarendon Press).—"Revival of Trade," by Wm. Teemer, F.S.S. (London: Elliot Stock).—"Larva Collecting and Breeding," by Rev. J. Seymour St. John, B.A. (London: W. Wesley and Son).—"Stray Feathers from Many Birds; being Leaves from a Naturalist's Note-Book," by Chas. Dixon (London: W. H. Allen and Co.).—"A Class-Book of Geography," by W. B. Irvine, B.A. (London: Relfe Bros.).—"The Proving of Gennad: a Mythological Romance," by Tandred Lewis (London: Elliot Stock).—"Seventh Annual Report of the United States Geological Survey," by J. W. Powell (Washington: Government Printing Office).—"Sketches of British Sporting Fishes," by J. Watson (London: Chapman and Hall).—"Practical Observations on Agricultural Grasses and other Pasture Plants," by W. Wilson, jun. (London: Simpkin, Marshall and Co.).—"Bibliography of Economic Entomology," by S. Henshaw (Washington: Government Printing Office).—"Insect Life."—"The Entomologists' Record and Journal of Variation."—"Doorsneden van Alkernen en Kerndeelingsfiguren."—"American Naturalist."—"Journal of Royal Microscopical Society."—"Canadian Entomologist."—"Leaflet of the Colorado Biological Association: Custer co. Branch."—"The Observer."—"American Naturalist."—"Botanical Gazette."—"Essex Naturalist."—"Transactions of the Hertfordshire Natural History Society."—"The Journalist."—"Sixth Annual Report of the Watson Botanical Exchange Club."—"Nature Notes."—"The Naturalist."—"The Entomologist."—"Research."—"The Amateur Photographer."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope," &c., &c.

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

TREES AND PLANTS AS AGENTS OF DENUDATION.

By JOHN H. COOKE, B.Sc., F.R.G.S.

OFTEN when rambling through the rocky gorges and beneath the craggy escarpments of these islands, my attention has been drawn to the silent though effective manner in which the humblest agents in the economy of nature have their energies directed and husbanded, in order that the greatest effect may be produced with the least expenditure of energy. How many would imagine that the same plant life which clothes the mountains, valleys, and plains on the earth's surface, and which imparts such a charm to what would otherwise be all that is sterile and desolate, is one of the most unremitting of the many agencies that are at work in degrading down the rocks of which the earth's crust is composed?

Year after year they play their part, unobtrusively it is true, but so sure and certain that as ages elapse the most stupendous changes are wrought in the contour of the earth's surface.

Measured by human experience, the changes are slow, and are but of little importance. The short span of existence allotted to man is not sufficient to allow him to appreciate their full significance, unless he is prepared to look back into the past and, using his own experience as an index, to consider the aggregated changes that have been effected through the instrumentality of apparently such insignificant causes. By so doing, he may arrive at not only an approximation of the condition of things that formerly existed, but may also obtain some idea of the nature of those forces that are constantly engaged in the work of destruction.

There is no spot in the two islands that will afford more genuine pleasure to the lover of Nature than will the charmingly situated valley of Emtahleb, with its rippling, purling streams and verdure-covered slopes; and that will, at the same time, afford more excellent opportunities for examining closely the conditions under which the plant life of the caves and gorges exists, and the part it plays both in protecting and destroying the rock surfaces upon which it grows.

Innumerable opportunities will present themselves to enable one to observe the shifts to which the larger trees resort in their struggle for existence. The rich though scanty soil that covers the slopes is not of sufficient depth to enable them to obtain that hold in it that their great size demands, and they therefore insert their roots into the cracks and crevices of the sandstone; and then, as in course of time, the increased bulk of the underground branches necessitates more space than the confined limits of the place will allow, the rock is shattered into fragments as effectively as though it had been subjected to the blows of a Brobdingnagian hammer.

Descending the tortuous path which leads to the springs at the bottom of the valley, an excellent example of the manner in which even a single tree may alter the physical aspect of the country in its immediate vicinity, is to be seen on the top of the cliffs that fringe its northern side.

The gaunt, spectral trunk of an old carob tree overhangs the beetling brows of the rugged limestone cliffs, and seems to invite inquiry into the manner in which it has obtained its strange position. It tells its own tale readily enough, and almost seems to be proud of the work of destruction in which it has been concerned, and which ultimately brought about its own ruin. In a fissure of the upper limestone, a deposit which forms the capping of all of the hills in Gozo and Malta, it had, in bygone years, taken root, and disseminated a perfect network of tough fibrous tendrils throughout every available nook and cranny.

In the mean time, the subjacent sand beds had been slowly eroded away by those atmospheric agencies that were constantly assailing them, and thus the upper limestone masses, deprived of their foundations, were left in a state of unstable equilibrium, which rendered them susceptible of the least mechanical strain, whether exerted from above or below.

The end soon came. Many of the rootlets had decayed, and becoming intermixed with other vegetable matter that had entered the fissure with the rain, a humus had formed, from which carbonic acid gas was evolved; this, acting on the limestone, caused an enlargement of the fissure, and the mass of rock thus attacked and weakened in every direction, at length broke off from the parent bed, and thundered down the slopes to the bottom of the valley. The tree was reft in twain by the force of the separation; and now gaunt and bare, its mutilated trunk sways to and fro with every breeze, as though moaning over the fate that had deprived it of its erstwhile home.

> "Cast anchor in the rifted rock,
> And o'er the giddy chasm flung
> His shattered trunk, and frequent flung,
> Where seemed the cliffs to meet on high,
> His bows athwart the narrowed sky."

Among the multiplicity of causes at work, hollowing and scooping out the caves that occur so plentifully all along the escarped sides of the valley, none are more indefatigable in their exertions to forward the work of destruction than the innocent-looking, sweet-smelling mint (*Melissa officinalis*), and the delicately-formed maiden-hair ferns, with which the walls and floors of the caverns are often draped. Carefully remove two or three of these plants from their places, and note how they have converted the upper film of the rock itself into a soil wherewith to assist them in their struggle for existence. Yonder wall, with its rich green mantle of ivy, deserves, too, a share of attention. How the tendrils of this hardy little creeper have inserted themselves into the most impossible of places, and have threaded and re-threaded the interstices until they have bound the whole mass as no mortar could have done it; but let us lift this grey green garb and expose the rottenness that exists beneath. The stones appear to be in a rapid state of decay, owing to the humid nature of its surroundings, a state which is clearly attributable to the plant-life that covers it, for see, those very parts that are not so covered, have successfully withstood all the combined attacks of the atmospheric forces to which it had constantly been subjected.

But of all of the plants that contribute towards this wasting away of the island deposits, the cactus or prickly-pear stands pre-eminently the first, as being the one to which the most mischief is due.

This plant is extremely hardy, and grows in great abundance, anywhere and everywhere in the islands. No soil seems to be too poor for it to take root in, and as soon as one of its oval, fleshy leaves is set, in the course of a comparatively short time a small forest of them may be anticipated. It often attains a considerable size, ranging from one to fifteen feet in height, and the fruit, which is of a rich red and yellow colour, is used by the peasantry as food, both for themselves and for their cattle. Like all other trees of vigorous growth, it does not confine itself to the soil, but causes its roots to ramify in all directions, and wherever it is possible to penetrate the underlying strata in search of those phosphates and carbonates that are necessary to its existence, and in which the soil may be deficient.

But the work of breaking up the rocks and converting them into soil represents only a very small proportion of the actual part which it plays as an agen of degradation.

The humus, formed by its decaying portions, evolves large quantities of carbonic acid gas, or carbonic dioxide, and this, when dissolved in water, imparts to the water some peculiarly destructive properties.

Pure rain-water, when alone, has but little effect upon lime; but, in conjunction with this gas, its dissolving powers are increased fifty-fold.

The rain-water that descends upon this decaying mass of vegetable matter, saturates itself with the carbonic dioxide, and then percolates through the limestone, and dissolves and carries away in solution the carbonate of lime of which it is largely composed. Evaporation follows, and by means of another chemical change this lime is again deposited as an insoluble substance, known to chemists as bi-carbonate of lime.

In this way vast caverns are formed in the very bowels of the earth, and many of them are found draped and festooned in a most fantastic manner, with stalactites and stalagmites that have been deposited after the evaporation of the water, which has done the work of excavation.

The "Ta Ninu" cavern on the "Ta Xaghra" hill at Gozo, and the stalagmitic cavern, popularly known as "Calypso's Grotto," in which the love-stricken goddess is said to have held her court, and to have entertained Telemachus after his shipwreck, may be cited as examples of the magnitude of the work effected through the instrumentality of objects apparently so trivial and insignificant.

But let us descend the terraced sides of the valley, passing *en route* the gnarled and twisted trunks of numerous carob trees, pomegranates, German medlars, wild plum trees, orange trees, silken-rye grass, and the host of other trees and plants with which the well-tilled slopes of this fertile spot abounds, and wend our way onward to the little springs whose rippling music had attracted our attention when standing on the heights above. What a blending of rural rusticity and wild rugged grandeur do we not here find? Immediately around us, the springs ripple and dance onwards amid a wealth of verdant watercresses and sweetly-scented wild flowers; while in the background looms up dark and gray the craggy heights of the Binjemmas, the brilliantly white limestones and the rich warm colouring of the marl-beds of which lend an effect of beautiful and substantial magnificence to the scenery.

But do our charges against the plant world of the islands rest here? Assuredly not. Let us examine the banks of the streamlets whose waters are eddying onwards through their marly channels, and we shall quickly find numerous fresh instances wherewith to implicate them. Several of the trees that are growing on the banks have been so vigorous in their exertions to drive their roots in the direction of the water, that they have undermined a neighbouring wall, and have caused their roots to appear in the very bed of the brook. This action has loosened the soil in the vicinity, and while in that state, considerable quantities have been carried onward by the current and washed into the sea.

This is an example, on a small scale, of what is happening to the banks of rivers in other countries, on a scale of considerable magnitude.

The undermining action of the waters is facilitated by the preparation made for them by the roots of the trees that grow on its banks; and when, as often occurs, the trees themselves are precipitated into the flood, either by the force of the gale or by being themselves undermined, they carry with them tons of soil, and thus open up inequalities, that can only be effaced by a considerable lateral extension of the river itself.

A walk in any direction along the southern coast of the island will furnish us with endless examples of the various ways in which "plant life" assists in degrading rock surfaces when the conditions are favourable. The southern slopes are strewn with boulders that have broken off from the upper limestone, and have rolled down the hillsides, thus suggesting, from their great numbers and huge proportions, the idea of a vast labyrinth of Cyclopeian anarchy.

And yet nothing more terrible has caused this destruction than the ceaseless attacks of those atmospheric agencies, which, by eroding the subjacent sand and marl beds, have caused the superincumbent limestone to break off and precipitate itself down the slopes.

Though this work is largely due to the combined action of a variety of aërial agencies, yet even here the humi of decaying vegetable matter plays its part and adds its quota in assisting in the work of devastation.

The weatherworn and fretted appearance which is the chief characteristic of the surfaces of the south-eastern portions of both islands may in like manner be attributed to these causes.

These extravasations on the rock surfaces are the means whereby, in winter time, a certain charm is imparted to these otherwise rugged and sterile portions of the islands, for the potholes then serve as so many natural flower pots in which luxuriates a wealth of verdure; but this state of things endures only for a few months, for when summer returns, plant life disappears, and once again the island dons that sterile, desolate garb which has earned for her such an unenviable reputation. But these periodical alternations have not been effected without leaving behind them some traces of their existence. This annual decay must be, and is, followed by its usual physical accompaniments, namely, the disintegration of the surfaces upon which the plants have rested, and thus new surface indentations are formed and old ones are, by the latest operation, still further enlarged.

I do not say that this is the only cause to which these surface excavations are due, but it, at least, seems to me to be the principal one.

From the preceding observations it will be seen that I have considered the effects wrought by one only of the numerous class of agents that are constantly engaged in wearing down the crust of the globe.

It is, however, one, the importance of which is not always so fully appreciated as it should be, for though it works as effectively as the others, yet by reason of its subtle methods, and the fact, that under certain conditions it exerts directly opposite effects, it does not always get the full credit for the actual work that it is responsible for.

The Lyceum, Malta.

THE BIRTH-PLACE OF THE ELECTRIC TELEGRAPH.

IT is a singular instance of the world's neglect that the original discoverer of so momentous and comparatively recent an invention as the transmission of messages by means of electricity should remain well-nigh unknown to the generality of educated mankind; but so it is. This is by no means a case in which any possibility of doubt exists for those who care to seek the truth, because, unlike most great inventions, the honour of its first conception and practical application was due to one man, and one only, and that at a time long prior to the improvement and adaptation of the electric telegraph for public purposes by Messrs. Cooke and Wheatstone in 1837.

I will not repeat the whole story in detail, but merely endeavour to show briefly how undeniable these statements are.

The Jubilee of the Electric Telegraph should really have been celebrated in 1866, instead of in 1887, as it actually was; celebrated too like the play of "Hamlet" with the Prince of Denmark left out; for the one to whom primary honours were due, namely, Sir Francis Ronalds, was not even mentioned in the laudatory speeches that glorified the occasion!

It will suffice to simply point out that Mr. Ronalds (afterwards tardily knighted when eighty-three years of age) erected a working telegraph at Hammersmith

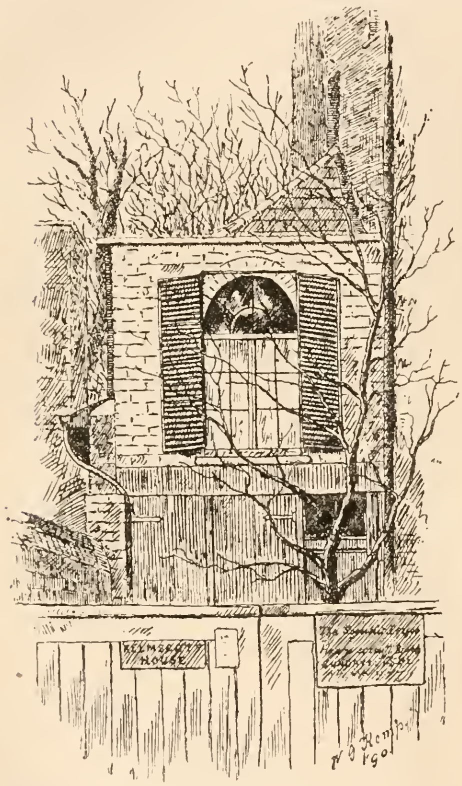


Fig. 84.—Birthplace of the Electric Telegraph.

so early as the year 1816, at a time when those who bore away the later laurels, and something more, of the invention were mere lads; and he still further made the fact indelible by illustrating and describing his invention minutely in a small book published by him in 1823.

Were any further proofs necessary they may be found in the interesting matters related in the following letters:—

"Hammersmith, December 6th, 1871.

"DEAR SIR,—About five or six years ago I was in the garden (then rented by a friend of mine) wherein this telegraph was laid down, when it was dug for and found after a lapse of upwards of forty years; what was then found and seen agreeing with the descriptions given in the book. Several yards of copper-wire were found where the ground had not been disturbed, by reason of a large rustic garden seat and alcove having been over it; a glass tube, or the greater part of one, with the copper-wire in it; and one of the joints with a short tube (glass) were also found: the copper-wire seemed to be in perfect order. The wooden trough and pitch had become consolidated with the earth, which was as hard as, and formed an opening like that of, a drain-tile, or the run of a burrowing animal.—Yours truly,

"J. A. PEACOCK."

In April, 1870, Mr. Thomas Gibson wrote to Sir Francis Ronalds:

"How well I remember when a school-boy, fifty-five years ago, seeing the clock apparatus in your little upper room over the stable, connected with another at the bottom of the garden, of the meaning of which I had but a very hazy apprehension; also the lines of wire stretched from frame to frame across the grassplot."

Fortunately, I was able to make the above sketch of the very place as it still exists at Hammersmith, wherein this incalculable invention had its birth, and although comparatively unknown on account of its earlier and greater honours as a monument of scientific discovery, the place is noteworthy as being attached to the residence of Mr. Morris, the well-known poet and artistic philosopher.

Beautifully situated, although not outwardly handsome, Kelmscott House, on the tree-shaded Mall, at Hammersmith, is a notable place for many reasons, but for the present purpose that little old-fashioned coach-house with its upper room is the centre of attraction, because that tiny room was absolutely the first electric telegraph station in existence, and from it Ronalds literally "fired a shot heard round the world," for occasionally his experimental telegraph signalled by means of pistol-charges exploded by the current.

He employed frictional electricity; the main advance made later by Cooke and Wheatstone consisting in their use of a galvanic current; but for the rest, as Mr. Ronalds wrote in reply to Mr. Cooke in 1867, it appears that some of the instruments shown in his book were closely imitated in the partners' specification of 1840, and the revolving dial-plate and electric indicator became the type for all subsequent dial telegraphs, while he foresaw and described the embarrassing phenomenon of retardation of current long before it became a practical difficulty in the working of submarine lines, and first effected the complete insulation of over and underground wires.

He foresaw also the possible uses of his invention, and indeed pointed some of them out with surprising clearness, especially in the case of forestalling criminals, for it must be borne in mind that one of the very first uses of the Cooke-Wheatstone telegraph was instrumental in effecting the prompt capture of the Salthill murderer.

That "little upper room" could not possibly be in better hands; for one of its present owners' ruling maxims is that truly excellent one of letting well alone as long as may be, for Mr. Morris, while eager to demolish and re-create the structure of society, is, on the other hand, a zealous stickler for preserving the structures of antiquity from the ravages of change and renovation.

W. G. KEMP.

57 *Westcroft Square, Ravenscourt Park, W.*

THE FOOD OF THE BIRDS.

IN the pages of SCIENCE-GOSSIP for November and December, 1889, I offered the results of some observations concerning bird-life in Worcestershire, and I now propose to record my notes on the varied foods on which they thrive in the orchard county of the West Midlands, knowing full well the relation between bird distribution and the many fruit pests which abound amid the apples and pears and plums. Whilst Miss Ormerod, backed up by the Royal Agricultural Society, and eminent American naturalists, are striving to devise a sure remedy for killing aphidæ, and accomplishing sterling work in each successive year in regard to agriculture generally, I think the mission of the birds is yet somewhat ignored; the wholesale destruction of nests and eggs (which, alas! are not yet protected by law in England) is, in view of these insect pests, little short of a national calamity; as the birds decrease, the blight and caterpillars tend to increase. Hay-bands steeped in a sticky composition of cart-grease and various ingredients, wrapped round the tree trunks in autumn, may prevent certain wingless coleopterous or lepidopterous insects from crawling up the fruit trees to deposit the ova: or solutions of Paris green, quassia, or Prussian blue may kill the aphis and larval insects in some stages without injury to the trees themselves. But the birds, if they are allowed fair play, will also do their part, even if they demand a toll later in the year by eating some of the ripening fruit. Some birds, I allow, are notorious pests in gardens, doing great harm and little good; but the converse of this is the general rule, and I beg to offer my own imperfect observations on the habits of some of our common English birds, coupling with my remarks the hope that legislation will before long come to the rescue of the birds which are being decimated on every side. Where it is even now unlawful to kill certain birds in the close season, the eggs are absolutely unprotected; hence the war of extermination against the peewit or common plover, for example, about which such complaints have lately been made in "The Field."

I. Between the first and third weeks in May last I watched closely the movements of a nightingale in a market garden. With glasses I saw the bird, in the intervals of song, devour several caterpillars from the blossoming plum trees. It feeds a great deal at night, is said to take small quantities of ripe fruit in the late summer, but its presence in gardens is most beneficial.

II. Three years ago, when a damson tree in a private garden was loaded with setting fruit, I watched the operations of half-a-dozen blue-tits (*P. cæruleus*) on several successive days. The tree was infested with aphidæ, threatening a total destruction of the immature fruit. These tits are said to destroy the young leaf-buds, and I wished to note what happened. For days the tiny birds, with many others, worked at the tree; leaf-buds and young shoots to some extent fell on the ground, together with fruit, but each leaflet appeared to be cankered, and the aim of the birds was most certainly the insects. I do not say that the plum tree was cleared of blight; but I do know that such an improvement was effected that the crop was practically saved, whereas, at one time, it looked as if every branch must be destroyed with the swarming aphis. All the tit family seem to search the fruit trees diligently for insect food, doing, in my opinion, far more good than harm.

III. The greenfinch, or green linnet, is one of the most injurious birds in a garden. If radish seed is planted in the open ground these birds find it out in some mysterious manner, and will grub up whole beds of seed. This fact I have often observed, and have little doubt that they ravage other crops.

IV. Blackbirds are a great nuisance among the soft fruits in their season; but at other times of the year industriously search for wireworm and other garden or field pests. Thrushes are less of fruit-robbers, but great slug-eaters.

V. All the warblers appear to me insect-feeders.

VI. The red-backed shrike is not uncommon in the Worcestershire orchards. It does not injure any vegetation as far as I can see, feeding on hard-winged insects and even young birds.

VII. The hawfinch is not by any means rare. The crop of a bird that I examined in winter time was full of hard laburnum seeds. Having somewhat of a bad name, I do not think it really does much harm.

VIII. As to the bullfinch, it certainly eats fruit-buds. A correspondent in the "Standard," however, recently called attention to the fact that his gooseberry bushes, having been most vigorously attacked by these birds, and many young buds eaten, afterwards bore fruit as if nothing had happened.

IX. Nuthatches abound, taking nuts, which they store in the crevices of the bark; they do not cause great harm. Tree creepers and woodpeckers are, of course, innocuous.

X. Wagtails, and pipits, all seem to be rather beneficial than otherwise; and the same applies to buntings.

XI. For the common sparrow (*P. domesticus*), having witnessed its depredations in Australia as well as at home, I have not a good word to say. Destroy them all, I say—as they did in biblical times if it is the same birds mentioned in the scriptures. The tree-sparrow (*P. montanus*) is useful.

XII. The starling is sadly trying in the cherry orchards when the fruit is ripening. On the other hand, what an enormous amount of good the flocks accomplish in the pasture lands by destroying the larvæ of the tipula lurking in the roots of the grass.

XIII. The rook is a much maligned bird. If it robs the grain and young shoots, how much more of the deadly wireworm does it consume? Encourage them to build everywhere is my advice.

XIV. Flycatchers do nothing but good.

XV. I have never been able to discover any harm done in garden or orchard by chaffinches.

XVI. There is an extensive group of birds, such as jays, magpies, carrion crows, and jackdaws, which are the enemies of game-keepers and poultry-fanciers. But I do not think they injure vegetation to any appreciable extent.

XVII. All hawks and owls are the farmer's friends.

XVIII. The goatsucker is most partial to night-flying cockchaffers and large insects.

XIX. Swallows, swifts, and martins prey on insect life.

XX. Crossbills extract the seeds from hard coniferous fruits only.

XXI. Wood-pigeons and their kind are destructive to crops rather than orchards. I should destroy them.

XXII. The corn-crake, very common in Worcestershire, does no harm.

XXIII. The siskin, arriving in autumn in our parts, cannot do much damage.

XXIV. The whinchat abounding in the fields either eats insects or grass seeds.

XXV. The wryneck loves ants and such food, and so does the wheatear.

XXVI. The goldcrest clears evergreen conifers from small insect life.

XXVII. The redstart is perfectly harmless, as are the robin and common wren, and hedge-sparrows.

XXVIII. The skylark is injurious to the spring corn. I have seen great numbers this year in a field where they did serious damage.

To sum up my notes, it leads to the conclusion that, as far as orchards and fields are concerned, sparrows (*P. domesticus*), green linnets, and wood-pigeons, are wholely injurious to crops, and larks partially so; that blackbirds, thrushes, and starlings do damage in the ripe-fruit season, but great good at other time; that rooks are friends to the farmer rather than enemies; that tits do some little harm possibly to fruit buds in their efforts to kill blight, and that most birds are innocuous, unless it be one or two of the hard-billed finches. I should like to hear the experiences of others on this subject.

C. PARKINSON.

NOTE ON A HANDY "BLOCK" FOR THE WORK-TABLE.

I APPEND a rough sketch of a work-table block which I have found handy as a dissecting microscope stage, a drawing stand, and an apparatus for satisfactorily hardening balsam mounts. As a rule, anything claiming to be a *multum in parvo* is a fraud; but having had this block beside me on my work-table constantly for several years, and its uses having suggested themselves one by one as needs arose, I feel sure that others also will find the apparatus an inexpensive and handy addition to their stock, and withal may improve upon it. It is a block of polished teak wood of the following dimensions:—

A D	5	inches
A B	6	,,
E B	7	,,
A *e*	$2\frac{1}{4}$	,,
ef	$2\frac{1}{2}$	,,
fc	$2\frac{1}{2}$	,,

The groove or recess in which the mirror M is fixed should have its three sides blackened; in mine I pasted dead-black paper on the sides of the recess. My mirror is from an old microscope, in which it was fixed by a pin which passed into a hole in an upright brass rod; the pin is now fixed in a hole bored half way up whichever of the three sides of the recess is most convenient for light. Two small brass pins are let into holes at the points *e* and *d*. For a reason to be stated later on, the exact dimensions of the block will have to vary in one direction: preferably in the width, A B.

For use as a stage for a dissecting microscope place a plate of photographic glass (about five inches square) on the top of the block. The object to be dissected can be worked at in a glass trough, or a watch-glass, or even on a slide laid upon the plate of photographic glass. The pins at *e* and *d* help to steady the glass plate. Light is thrown up through the object by the mirror M. The lens used may be in a separate stand such as a gem-engraver's, or preferably on one of the small stands made by Baker and others for pocket and platyscopic lenses, and which can be stood on the glass plate.

If intended to be used as a drawing-stand, the width, A B, or at any rate one of the dimensions of the block, should be such that when added to the height of the centre of the eye-glass from the table when the microscope is inclined horizontally for drawing the total will be ten inches. The body of the microscope being thus laid in the horizontal, the stand is placed on the block; the eye-piece will now be exactly ten inches from the table, and drawings can be executed and measurements made with accuracy, while the facility with which the normal distance from eye-piece to paper is secured is a distinct encouragement to both the drawing and measuring of objects. The mirror M should be removed when the block is used for drawing.

When used in the hardening or "setting" of balsam mounts, remove the mirror, and push a small spirit-lamp into the groove or recess. Then place an

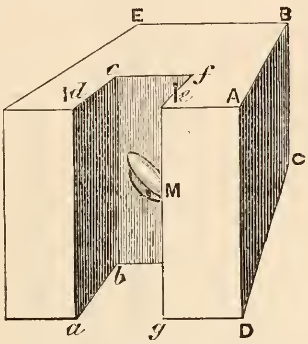


Fig. 85.—Handy Block for Microscopic Work-table.

ordinary brass mounting-table, such as Baker sells for a few shillings, on the top of the block, and immediately over the recess and flame of the spirit-lamp. When thus arranged, the brass plate of my mounting-table is about five inches above the flame of the spirit lamp. The balsam mounts, with or without a flattened bullet on each—to keep the cover glass in place—are now laid on the brass table, and may safely be left to themselves for twenty minutes or half-an-hour, in some corner of the room not affected by draughts, and not likely to be disturbed. Be careful that the block stands perfectly level, or the cover-glasses are apt to get displaced when the balsam liquifies.

As suggested already, the block described above was not designed originally for more than one purpose, viz., as a stand for dissecting objects upon. From time to time I have found a new function for it, and, as already stated, have it beside me always, using it as occasion requires for one or other of the purposes indicated above.

W. J. Simmons.

Calcutta.

Sparrow's Eggs Spotted at Smaller End.—My brothers have lately found another house-sparrow's egg marked at the wrong end. The egg was also somewhat abnormal in shape, being long and narrow.—*P. Tracy, Ipswich.*

ANIMALS AND MEDICINE.

By Hulwidgeon.

IV.—Cetacea.

"To fortify his brain and stomach . . . . holy water and essences of musk and ambergris."—*Le Sage.*

Tooth Whales.—That leviathan benefactor of the human race, the whale, was not overlooked by the prying eye of the apothecary, searching through Nature for subtle essences, ashes, oils and spirits to compound his medicaments with, nor did the huge brute fail to respond with magnificent and becoming generosity. But, however well acquainted with the advantages derivable from it, we cannot compliment their utilizers on their knowledge of the creature that furnished them.

For instance, says "Nature Display'd" (p. 243), "The name of whale is given to two sorts of fish; one is small, furnished with teeth, and his brain produces that white substance, called *sperma ceti*, so much esteemed by the ladies. The other is the large whale, who is destitute of teeth; but then he is supplied with two large tushes, a dozen or fifteen feet long, which rise out of his jaws and conveniently enable him to amass together the weeds which are generally supposed to be his food. These tushes, split into small divisions, are the pretended whale-bone, whose present usefulness seems almost confined to the hoop-petticoat" (the condemnation of which is proceeded with).

Some years later, the species of whale had been multiplied, committed to the Plagiari order of fishes, and distributed into six genera, viz., "Physeter, Delphinus, Balæna, Monodon, Catodon, and Thrichechus."* (Howard, vol. iii. p. 1598.) But beyond this all is in veiled disorder. For instance, seeking for our sperm whale, we find the genus Catodon embraces those whales "having no teeth in the upper jaw, nor any fin on the back. The species of it are: (1) The spermaceti whale, called by authors *cete*, *cetus dendatus*, and *balæna major*, with the above-mentioned characters and the fistula in the neck. (2) The Catodon, with the fistula in the snout, called by authors *balæna minor*." (Howard, vol. i. p. 465.) Elsewhere the same author informs us (vol. i. p. 418) that the Cachalot is, "in Ichthyology, a cetaceon fish with teeth in the lower jaws only. The blunt-headed Cachalot is one of the species that yields the spermaceti." It is very evident that the first, third, and fifth genera of whales had been hopelessly confused with each other.

At the close of the period under survey, however, the Cetus, Catodon, Cachalot, (pseudo-)Balæna, and other sperm whales had been correctly identified as the *Physeter macrocephalus*, the large-headed sperm and ambergris-bearing Cetacean. To the still

---

* Trichechus, the rosmar, morse or walrus; not a cetacean at all.

retained genus Balæna, though of a different sub-order from the Catodon, was rightly attributed the production of "whalebone."

Succinum cinereum, *S. griseum*, *ambragrisea* or *ambergris*, according to Hooper (p. 40) is "a concrete, bituminous substance, of a soft and tenacious consistence, marked with black and yellow spots, and of an agreeable and strong smell when heated or rubbed. It is found in very irregular masses floating on the sea near the Molucca Islands, Madagascar, Sumatra, on the coast of Coromandel, Brazil, America, China and Japan. Several American fishermen assured Dr. Schwediawer that they often found this substance either among the excrements of the *Physeter macrocephalus*, or in its stomach, or in a vessel near the stomach. The medical qualities of ambergris are stomachic, cordial and antispasmodic. It is very seldom used in this country." *Diambra* was "an aromatic composition in which was ambergris."

Although of unfrequent use at the close of the century, this article often occurs in the earlier pharmacies. Bate and Salmon hand it on as an ingredient of the catholical "Goa stone" (p. 714), to which I shall have occasion later on to recur. The

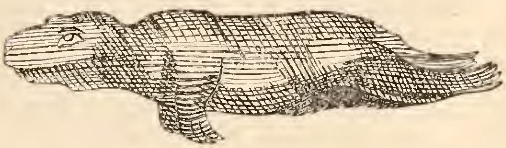


Fig. 86.—The Sea-Calf. (From "Nature Display'd," Plate 23.)

preparation of "Spirit of Ambergreese" will be found on p. 36 of Bate's "Dispensatory."

Salmon's *Tinctura ambrægrisæ* (p. 220) was administered for nervous depression, etc., mixed with a "convenient cordial, in a fainting fit or sickness at heart."

Of a more constant service in medicine was the spermaceti yielded by the same creature as was ambergris. Hooper describes it (p. 756) as "an oily, concrete, crystalline, semi-transparent matter, obtained from the cavity of the cranium of several species of whale, but principally from the *Physeter macrocephalus* or spermaceti whale. It was formally very highly esteemed, and many virtues were attributed to it, but it is now chiefly employed in affections of the lungs, *primæ viæ*, kidneys, etc., as a softening remedy mixed with mucilages. It is also employed by surgeons as an emollient in form of cerates, ointments, etc." Hooper retains the celebrated *Linimentum album*, *Unguentum cetacei*, or *U. spermaceti*, "a simple emollient ointment" compounded of spermaceti, wax and olive oil (p. 830), and the *Ceratum album* or *C. spermatis ceti*, a mild, emollient, cooling and unctuous cerate, composed of the same ingredients (p. 187).

Spermaceti (known also as *Sevum ceti* and *Cetaceum*), had been included in the various materia-medica from an early date. It was classed by Cullen and Murray among the demulcents. Buchan, in his

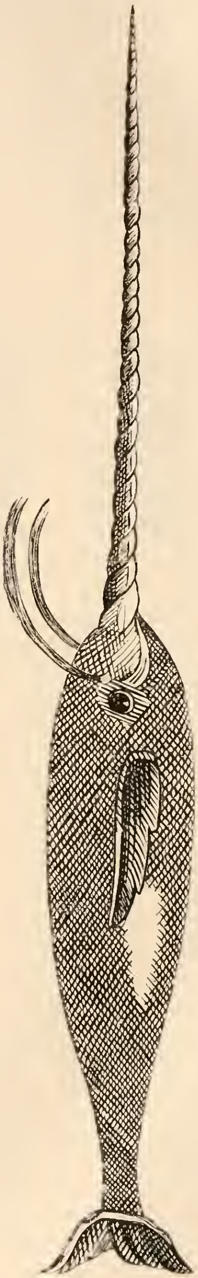


Fig. 87.—The Narwal or Sea Unicorn. (From "Nature Display'd," Plate 23.)

comprehensive handbook, which still has a circulation, places it (Apdx. p. 8.) among the simples which he considered "ought to be kept in readiness for private practice." He places the white ointments and liniments, and a pectoral bolus containing the same substance, among the medical preparations likewise to be held in store (Apdx. pp. 36 and 12).

Nevertheless, at this date, its use was comparatively restricted. By reference to Bate, we find abundant examples of its wider application formerly; it occurs in large proportions in his *Mixtura anticolica* (p. 554), a mixture to remove stones and open "the lungs and other bowels."

Pulvis ad casum (p. 627), "a pouder against inward bruises by falls."

Unguentum ad foveas (p. 691), an "excellent thing to take away the pittings or marks of the small-pox. It alleviates the pain and takes away the acrimony."

Emplastrum mammillare (p. 700), for tumours, etc., in the breast.

Ceratum album (p. 695), which I am tempted to quote at large, as showing the complicated messes from which the later and simpler compounds were developed. We are bade ℞ "white wax (4 oz.), oil of bitter almonds (5 oz.), the whitest and purest sperma ceti (1 oz.), ceruse washed in rose-water (½ oz.), camphire (½ oz.). Mix them;" and we are assured we shall have "indeed an excellent cosmetick," possessed of many medicinal qualities. Salmon tells us that it "may be laid upon ladies' foreheads and faces at night, going to bed, and taken off the next day, to make the skin fair and smooth."

We also find pure spermaceti regarded as an approved remedy for hoarseness and simple throat ailments: *vide* Howard, vol. ii. p. 1148.

NARWHAL.—The narwhal's ivory was held in great esteem by physicians, but human nature is hardly above the suspicion that they must sometimes have substituted that of other animals for it. Salmon, however, asserts its non-rarity. Commenting on the extraordinary "Red Hungarian powder," to which I shall have occasion to refer again, he writes (p. 634): "In some compositions there is unicorn's horn added, but that which supplies the place thereof, in all apothecaries' and druggists' shops, is the horn of a great fish found in Greenland, which the islanders (?) call Narwall, whose horn is white, hard, heavy, twisted, hollow within for some space, and from one to two ells long, which serves him as a defence against other fish, and to kill great whales. The horns of this great fish were formerly very rare, and the fish itself very little known, but the late constant fishing in those seas have (*sic*) made them more frequent and common in England, Holland, Denmark, Germany and other places."

All the same, "Nature Display'd" gives us but a very hazy account of this creature. "The Danes and other northern people," it says (p. 241), "catch a very large fish called a walruis or narval, whose teeth are more esteemed than those of the elephant, because they are an ivory of the purest whiteness and not subject to grow yellow. The left jaw of this creature is armed with an ivory horn, extending sometimes to a length of fourteen, fifteen and sixteen feet. These horns are to be met with in the cabinets of the curious, and have been thought to belong to the unicorn, who is an animal entirely chimerical," &c.

The teeth above referred to were evidently those—highly valued—of the walrus, which no doubt furnished its quota of "the whitest and purest ivory" to the physician's laboratory.

TOOTHLESS WHALES.—Coming now to the Mysticete, we find the so-called *Balæna macrocephala* (*B. mysticetus*,) supplying our apothecaries with oil and our surgeons with baleen. Concerning it we may obtain a very immense idea by turning to pp. 242–3 of "Nature Display'd," wherein it runs:—"Of all the species of fish who are never brought to our tables, the whale is undoubtedly the most beneficial. It is an animal of stupendous size, an hundred and thirty, an hundred and sixty, and sometimes two hundred feet in length, and extremely profitable to those who engage in that fishery . . . The fat of a small whale, about sixty or seventy feet long, sometimes produces an hundred casks of oil; and a whale of two hundred feet in length generally yields sixteen or twenty tons." After an enumeration of the manifold uses of this oil, "it is even employed in painting and physic."

"Whalebone" is perhaps hardly a legitimate subject, since its utility depended rather on structural form than convertible material. But in the surgical branch of physic its services were various and considerable; if not itself a medicine, it was at least capable of becoming a medical instrument.

It was extensively used as a probang with a piece of sponge fixed on one end (Hooper, p. 653), for removing obstructions inside the human body; and its litheness made it invaluable whenever a flexible and infrangible substance was required, that would not be acted upon by the humours of the body and so avoid contamination.

V.—SIRENIA.

MANATEE.—In a recipe of Bate's (p. 624), *Pulvis antipyreticus*, we find figuring no less a creature than our old friend the merman. This "powder against fevers" was composed of two ounces of *Lapis manati* to one of (the herb) *Sanguis draconis*, mixed and pulverised. Says Bate: "It seldom fails of curing agues in the spring-time. Dose, one dram, an hour before the fit" (!). Salmon adds some acceptable information. "The *Lapis manati*," he tells us, "is a white hard bone (hard like a stone), taken out of the head of the manatea or sea-cow, sometimes like a tooth* and resembling the whitest ivory, but

* Query, the walrus tusk in masquerade again?

much harder . . . It is a fixt alcali, and something styptick, and therefore a proper specifick against agues and fevers for which it is of singular use, as also against all inveterate pains of the stomach and bowels, cholicks, &c."

Those who have access to Salmon's "Seplasium," which I confess I have not consulted, may therein (lib. vii. cap. 28) discover the other many "vertues and several preparations" of the manatee-stone.

VI.—Proboscidea.

Elephant.—Pliny tells us that the Indians made a mixture of the bloods of dragons and elephants, called cinnabar. But, though cinnabar, both native and factitious, was in use by eighteenth-century physicians, the former was a metallic substance and the latter seems to have been invariably compounded without the inclusion of the blood of either of these creatures.

Ivory, indeed, seems to have been the only subsidy to physic demanded of the great proboscidean, and this he afforded liberally in conjunction with a number of other animals which I have already mentioned or shall, later on, enumerate. By far the greatest amount was furnished by the elephant. The trade in its tusks is of quite the remotest antiquity. The ivory of Scripture was obtained by this means, so was that of the ancient states of Southern Europe. At the beginning of the Renaissance, Marco Polo, the pioneer of modern travel, affirms that the traffic still flourished in the East. And so it has continued right down to the present day; ourselves and our ancestors, our neighbours and theirs, have all been unfalteringly supplied with this invaluable commodity by the monarch of the palæotropical forests.

The medical status of ivory was based on its alkaline properties, and on their account we find it quoted in a multitude of former prescriptions. For some unknown reason—or perhaps for none—Bate seems to have had a predilection for its use. He puts its raspings in his *Vinum chalybeatum* (p. 565), to the disapprobation of Salmon, "for, being fixt alcalies, they will destroy the acid of the wine, which is the principal instrument for drawing forth the internal property of the Mars" (iron). This chalybeate wine was for the cure of dropsies, jaundices and ague, a purpose which Bate attempted with other medicines containing the same ingredient. I append a few references to remedies containing ivory in greater or less proportions:—

Pulvis cardiacus Eboratus (p. 626) consisted of one ounce of magistery of ivory, one ounce of cinnamon, and three ounces of sugar, mixed and pulverised. It was reputed a cordial, like the *P. c. corallatus*, but reckoned more astringent, and was given in doses of half to one dram, in syrup or confection, twice a day for weakness.

P. diatrachia (p. 637), a kidney-regulating powder, of which it forms a sixth part.

Decoctum ictericum (p. 584), for jaundice.

Gelatina coroborans (p. 612), for consumption.

Extractum ictericum (p. 279), for jaundice and green sickness; and in fever powders (p. 634), uterine tablets (p. 667), and worm tablets (p. 672).

Mammoth.—I have already stated that the use of defunct species of animals was not unknown in medicine. Foremost among these, perhaps, was that pleistocene monster whose remains may yet be strewing the northern ocean bed. That ivory was of frequent request in pharmacy, has already been made evident. That mammoth-ivory was known to commerce during the eighteenth century is as much beyond dispute. Smollet, writing in 1769, of Great Tartary, remarks: "Great quantities of a kind of ivory, called by the natives mammon's-horn, are found in this country and in Siberia on the banks of the Oby. This horn has all the appearance of the teeth of a large elephant, but when or how these teeth came so far to the northward, where no elephants can at present subsist during the winter season, is what we are unable to determine. They are commonly found on the banks of rivers that have been washed by floods. Some of them are very entire and fresh like the best ivory in all respects, excepting only the colour, which is of a yellowish hue. In Siberia they make snuff-boxes, combs, and divers sorts of turnery ware of them. Some have been found weighing above an hundred pounds English." ("Present State," vol. vii. p. 17.) It is quite within the bounds of probability, then, that the tusks of this gigantic woolly pachyderm, after an immurement of centuries in their icy tomb, found their way into the shop of the London druggist to be rasped and pounded into remedies for dames and dandies whose delicate livers had fallen out of order.

OBSERVATIONS ON PLANTS DURING THE MILD WINTER 89-90.

The above winter having been so much milder than an average winter, it gave peculiar facilities for observations regarding any variation from the usual form adopted by plants during an average winter season.

There is no doubt that such variations, when thoroughly studied, would lead to some important points regarding extension or diminution of range, temporary or permanent variation in structure, development, and so on.

All I intend to do here is to mention a few facts which came under my own notice in a locality which is familiar to me, and in which I have been in the habit of studying the plants both in summer and in winter for many years.

Making an imaginary division of the plants coming under my notice by dividing them into three classes, first, those which grow to maturity in all the extremes of seasons, whether extremity of heat or cold; second, those which show great variation in maturing over a series of seasons, that is, plants which grow much better in a warm season than what they do in a cold one, or the opposite; and third, those plants which do not exist under strict natural conditions in this part, that is, plants grown in gardens, garden and some other weeds, and agricultural plants.

The first class was the least influenced by the mild winter.

It appears to me that plants which grow to maturity and produce seed or fruit here, over all the variations of seasons, as a rule rest during the winter, especially when the conditions under which they grow are quite favourable for their development. An abnormal season produces less variation from their usual habits than in the case of the second or third class, into which I have divided them. I may mention a few of my first class: the hardier grasses, the heaths, winter-green, European chickweed, winter-green, small upright St. John's wort, primrose, dog and the marsh violets, the bedstraws, hardier speedwells, and the hardier crowfoots, indigenous vetches, and so on. All these were very little influenced by the mild winter.

The second class showed signs of growing; among these I may mention foxglove, bishop's weed, some of the bistorts, caraway, and some others belonging to the same natural order as the latter, and so on.

The activity in growth during the warm, or rather mild, days of winter was best seen among those of our third class, of which we may mention spring flowering, and some other garden plants; of garden weeds —dead-nettles, groundsel, those speedwells which grow in gardens, crowfoot, dandelion, &c.; field weeds, spurge, grasses which grow as weeds, hemp nettles, certain speedwells, violets, forget-me-nots, field spurry, and so on.

Among the more noticeable agricultural plants which showed more than ordinary winter growth we may mention rye grass, which seems to grow whenever there is a certain amount of mild weather; turnips, which are similar to rye grass in this respect.

Seeds of oats which had been shaken from the heads in harvest germinated and grew in many cases, whereas in an ordinary season the frost would have destroyed their germs.

The last observation I will mention is a rather singular one. It is, that in the case of those plants which are both grown in gardens and are growing indigenous in the locality, the specimens in the garden grew more in the mild weather than the plants which are in their natural haunts.

The most remarkable case of this was that of the barren strawberry—a specimen in the garden was in flower in March, whereas those specimens of it growing indigenous on a moor here showed little advance in its growth at the same date.

WM. WILSON, Jun.

Alford, Aberdeen, N.B.

NOTES ON NEW BOOKS.

THERE are few volumes which reach us more welcomely than the strongly-bound and neatly got-up volumes of the Geological Survey of the United States. They are distributed to scientific men and scientific journals all over Europe, in striking contrast to the mean and niggardly manner with which the scientific publications issued by our own Government are dealt out. The results, of course, are highly favourable to those American scientists whose papers appear in these Reports, inasmuch as the scientific world is thereby made acquainted with their writing and researches. On the other hand it would appear as if the English Government did their very best to hide the lights of our geologists under a bushel. They pour forth Blue Books, which nobody ever reads, in avalanches and cataracts, and then publish the reports of our Geological Survey (on which a great many new openings for mineral wealth may depend) at prices which are practically prohibitory. We have received the "Seventh Annual Report of the U. S. Geological Survey," in which, besides the report of the director, Major J. W. Powell, on the different kinds of work now in progress, we have the following lengthy papers: "The Rock Scorings of the Great Ice Invasions," by T. C. Chamberlin; "Obsidian Cliff, Yellowstone National Park," by Joseph P. Iddings; "The Geology of Martha's Vineyard," by Nathaniel S. Shaler; "The Classification of the Early Cambrian and Pre-Cambrian Formations," by R. D. Irving; "The Structure of the Triassic Formation of the Connecticut Valley," by William Morris Davis; "Salt-making Processes in the United States," by Thomas S. Chattard; "The Geology of the Head of Chesapeake Bay," by W. J. M'Gee. This handsome volume is illustrated by 114 artistically-produced plates and woodcuts.

The Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley, by J. S. Newberry. This is a Memoir prepared by request of the Survey on the above interesting subject, and is illustrated by twenty-six magnificently drawn plates.

The Geology of the Quicksilver Deposits of the Pacific Slope, by George F. Becker. A large volume of close on 500 pages, accompanied by an atlas. Everything that by any possibility could be associated with the geology and origin of these famous deposits has been exhaustively and skilfully brought together by the author.

From the U. S. Department of Agriculture we have received a highly useful volume prepared by Samuel Henshaw, on the "Bibliography of the More Important Contributions to American Economic Entomology." It is a very useful book of reference to all those whom the subject concerns.

From Sacramento we have received the "ninth annual report" of the State mineralogist, Mr. Irelan, Jun., beautifully illustrated, and containing papers by different geologists and others on the geology and mineral productions of California.

The Colours of Animals, by E. B. Poulton (London: Kegan Paul). This is the latest issued volume of the now famous "International Scientific Series." The subject is a highly important and deeply interesting one; and, as the present volume relates more especially to insects, no other man could have been so fitly chosen to write it as Mr. Poulton. His experiments and papers on the colours of chrysalids are already well and widely known. The author devotes himself chiefly to the lepidoptera, but enters into the general physical causes and use of animal colours. There are two highly interesting chapters on protective resemblance in lepidoptera, and several others on the same subject as bearing on the vertebrata. The two chapters on variable protective resemblance in insects, and the two following on warning colours, will be read with keen interest by all naturalists. The book is well illustrated and clearly printed, and in stating that there is not a single dull page in it we are only making a trite and very ordinary remark.

Stray Feathers from Many Birds, by Charles Dixon (London: W. H. Allen and Co.). An exceedingly handsomely got-up volume, well-printed and beautifully illustrated. The author is an old contributor to our columns, which were enriched by his articles many years ago. He is well known as an enthusiastic ornithologist, and as an able and pleasant writer on ornithological subjects. The present volume fully sustains his reputation. It contains fifteen chapters on separate subjects, every one of which is interesting to an extreme degree.

Half Hours in the Green Lanes, by J. E. Taylor (London: W. H. Allen & Co.). Our position with regard to this well-illustrated book forbids us to do more than to state that this is the seventh edition, which pretty clearly shows that the public have taken it under their patronage, whether wisely so or not. This seventh edition has been thoroughly revised, and brought up to date.

Mungo Park and the Niger, by Joseph Thomson (London: Geo. Philip and Son). This is another of the welcome and handsome volumes of the "World's Great Explorers" Series. The old world travels of Mungo Park and the quiet and brave simplicity of the man make this work read like a novel. It ought to have a very wide circulation now that all things relating to African geography are being so much discussed. No better or more sympathetic author for such a book could have been found than Mr. Joseph Thomson, himself a distinguished African traveller.

Days and Hours in a Garden, by E. V. B. (London: Elliot Stock). The present is the seventh edition of this delightfully written little book, which we cordially recommend to all those who love gardens and flowers and things appertaining thereto. It is divided into twelve chapters, one for each month in the year.

Rambles and Reveries of a Naturalist, by the Rev. Wm. Spiers (London: Ch. H. Kelly). A very pleasantly written volume. Many of the chapters occurred in the *Wesley Naturalist*, of which the author was co-editor. The range of subjects is enormous, and varies from "Star-gazing" to "Sea-weeds," but Mr. Spiers is a highly intelligent and exceedingly well-read guide, and the reader may fairly trust him. Many of the illustrations are old acquaintances. They are none the worse for that, only they would have had a better effect if many of them had been printed right side up.

Plant Organisation, by R. Halstead Ward (Boston, U.S.A.: Ginn & Co.). This is the second edition of Prof. Ward's exceedingly useful and easily understood review of the structure and morphology of plants. It consists of a written method adapted to the use of students which can be used in connection with any text-book of botany, and either with or without the employment of technical terms. The illustrations are numerous and simple, but highly effective and useful.

Pond Life: Algæ and Allied Forms, by T. Spencer Smithson (London: Swan Sonnenschein). This is one of the shilling volumes of the "Young Collector Series," and we are doing no injustice to the other writers in saying that it is by far the best. We are frequently asked to recommend a book on freshwater algæ, and take the opportunity to strongly recommend that now under notice. The illustrations are numerous and unusually good.

British Sporting Fishes, by John Watson (London: Chapman & Hall). Of Mr. Watson's previous books on popular natural history, such as his "Sylvan Folk," etc., we have already had the pleasure of speaking favourably. The same bright and attractive style of writing pervades the present volume, which describes the life and habits of such sporting fishes as the salmon, trout, grayling, pike, perch, roach, rudd, carp, bream, barbel, dace, gudgeon, and various small fry, in addition to papers on "Fish Poacher," "Fish Stews," etc.

Practical Observations of Agricultural Grasses and other Pasture Plants, by Wm. Wilson, Jun. (London: Simkin, Marshall, & Co.). The second edition of this highly useful little work. The author is well known as a practical experimenter on the subject, and as it relates to the most important matters with which scientific agriculture has to deal, every young agriculturist who intends to rise in the profession cannot do better than forthwith procure a copy and diligently study it.

National Health, by Dr. Benjamin Ward Richardson (London: Longmans). This is an abridgment of the author's work on the "Health of Nations," and the most practical and popular parts of the larger work are here condensed into a handy and cheap volume. It is a highly useful and valuable little work. Dr. Richardson groups his chapters under four headings as follows: "Health in the Dwelling House," "Health in the School," "The Health of the Community," and "The Health of the Future."

The Workhouse and its Medical Officer, by Alfred Sheen (Bristol: John Wright & Co.). The second and re-written edition of a work that cannot fail to be of value to medical officers and all who have to deal with provincial workhouses and their belongings.

Mr. W. P. Collins' catalogue of works treating of "Invertebrata (Recent and Fossil)" is to hand, and contains, as usual, a good assortment of books at moderate prices. The same may be said of Messrs. Wesley's entomological, and of Mr. John Wheldon's zoological catalogues.

NOTES ON VEGETABLE TERATOLOGY.

WE shall be pleased to give due notice to all extreme cases of floral or foliar departures from ordinary specific types of plant structures.

Miss Pope, of Maidstone, writes: "I beg to report a case of "fasciation" in *Cardamine pratensis* (Cuckoo flower, or lady's smock), in which the thickened stem bore some seventy flowers."

Mr. M. W. Gale, of Weymouth, sends us specimens and says: "In a specimen of wood spurge recently found at Portland there are at the conjunction of the involucre stems, and within the lower involucre, solitary imperfect flowers consisting apparently only of abortive filaments set round with crescent-shaped glands. I was familiar with this plant years ago, but never remember to have seen these rudimentary developments. Can it be then in an evolutionary process it is preparing to produce additional flowers? The true flowers, which are above the false ones, have the organs mentioned, but also pistils and stamens corresponding to those described in botanical works. I see no notice in any book of these false flowers. Can any of your readers throw light on this matter?"

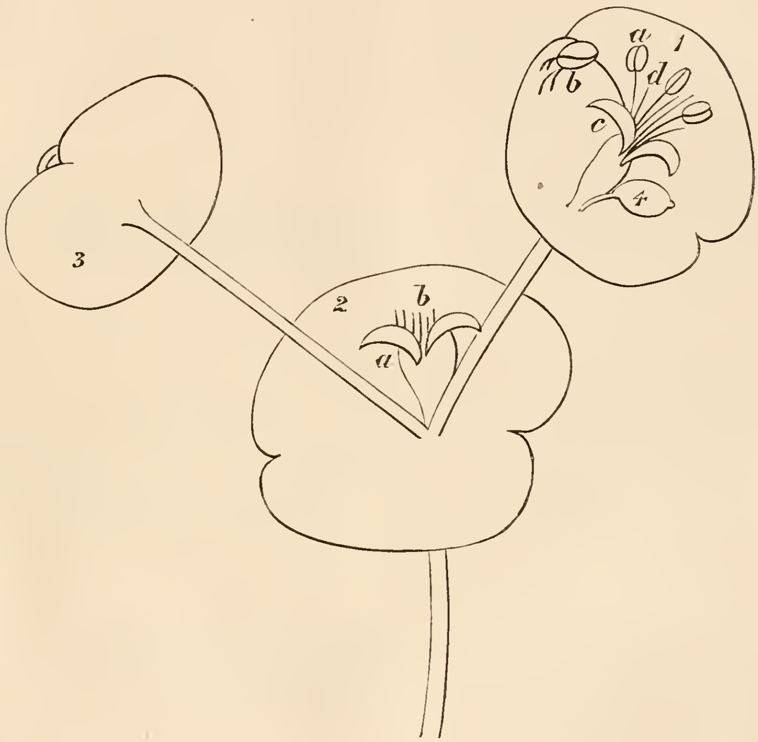


Fig. 88.—*Euphorbia amygdaloides* (magnified). 1. Perfect inflorescence. *a*, stamen; *b*, pistil; *c*, gland (crescent shaped); *d*, filaments. 2. Imperfect inflorescence. *a*, gland (crescent shaped): *b*, filaments. 3. Posterior view of involucral leaf. 4. Budding inflorescence.

A CHAT ABOUT WORMS.

By the Rev. HILDERIC FRIEND, F.L.S.

WHEN a famous naturalist presented the public a few years ago with a volume entirely devoted to the doings of earth-worms, a cry of surprise was heard on every hand. We never thought that so much could be said about a worm! Those who think that Darwin knew all that could be known about these despised creatures will probably regard us with suspicion, if we say that he only touched the very fringe of a great and entrancing subject, and that his knowledge was limited to the habits of one or two species out of a vast number, every one of which has just as much to teach us, if only we were as willing and able to learn as Darwin was. I can imagine a good many people who think they have some scientific information, telling us that they did not know we had more than two or three species of worms in England, and that their appearance and habits are so similar that when you know something about the commonest you have a key to everything worth knowing. Such was the state of our information only a very few years ago, and it is only within very recent years that we have been made aware of the existence, both at home and abroad, of an enormous number of species of Annulosa, or earth-worms, and their allies. There are still undoubtedly scores of worms undiscovered, for in the vast Empire of China, the Continent of Africa, the untrodden wastes of Australia, and the unexplored regions of many lands near and far, there must be hidden under the soil myriads of creatures whose very existence we have never suspected. Every year new discoveries are being made, and even in our own country the helminthologist is able from time to time to whet his appetite for further exploration, by turning up an undescribed species. Although many new indigenous species cannot well be expected to reward the search of the worm-collector at home, the ever-increasing acreage of glass and greenhouse, with the constant introduction of new plants from little known regions of the globe, afford favourable opportunities for worm-study to those who have the good fortune to be able to visit conservatories and hot-houses whenever they please.

It may be asked, where shall we find materials for the study of worms, and how shall we know them when found? In reply to the first question it may be stated that there is scarcely a place where they may not be found.

If we take the worms in their widest sense, as corresponding with the ANNELIDA, we may say that they are to be found almost everywhere. Some are found attached to marine algæ (*Spirorbis*), or building their calcareous homes on the shells of the mollusca (*Serpula*), throwing up their tubes here and there along the sea coast (*Terebella*), or in large masses at low water mark (*Sabellaria*), burrowing in the sands down to mid-tides (*Arenicola*) or in meadows, pastures or the open country (*Lumbricus*), lying under stones in streams (*Allolobophora*), or on the margins of ponds and locks (*Allurus*), and enjoying the fat living of a manure heap (*Brandling*), or surprising the florist in his greenhouse (*Megascolex*), not to mention other localities or genera. As I have found the whole of these during a single season in Cumberland, I am not holding out any false hopes to the young naturalist when I say that, if he has the pleasure of living within reach of the sea-shore, he may in one year collect typical specimens of all the principal genera of British Annelids. It may be remembered that they are about equally divided between sea and land, and that of the inland species a goodly number are partial to paludal situations—lying under stones or in the mud.

Now comes the tug of war. How can I determine my captures? This, it must be admitted, is not always easy; but then all real research involves some amount of labour, and sometimes of disappointment. Let us say, however, that it is always best to begin with the well-known, and proceed to the less known or altogether unknown. Many books dealing with the subject in a partial manner are available, but the student must always fall back more or less upon his own resources. For example, the Lugworm (*Arenicola piscatorum*) of the sea-shore is so well known that when once seen in a book or in a state of nature it will never be forgotten, and as every fisherman along our sandy shores digs this creature out for bait, it is always possible to procure it in abundance. The little coiled up shells or tubes, again, which are found encrusting almost every bit of dead sea-weed cast up on our shores, are so well-known (*Spirorbis nautiloides*, Link, and *S. lucidus*, Mont.) that they will occasion no difficulty. It is when he comes to the worms which build no homes, and at first sight have no distinctive characters, that the student meets his real difficulties.

Let us confine ourselves to what are best understood as earth-worms. Here we have at the outset for our guidance the common Lumbricus, whose form and habits are familiar to every one. Whether we dig in the garden, mow the lawn, or plough the field, whether we watch the birds in search of their breakfast, or ourselves seek the worm as a bait for fishing, we recognise the common worm without difficulty, although we should not find it an easy matter to specify what are the "signs" by which we identify it. A little careful attention to its external structure, however, will afford us certain characters which will be useful. We observe the number, position and shape of the bristles or hairs which exist on each of the body segments; the position and appearance of the mouth and clitellum (Fig. 93), the colour of the creature when clean, as well as the general form of the entire animal. If we descend to microscopical details, we pass beyond the region of what is popular, and our chat becomes professorial. Now, with these general principles in mind, we can pass from the common worm (*Lumbricus terrestris*) to the green worm (*L. viridis*), which is found under stones in cattle fields, and is distinguished by its colour. The other distinctions as well as the name-aliases are omitted because the worms are being re-arranged by the systematists, and until their terminology assumes some definite form the old and established terms had better be retained to avoid confusion. Another British worm (*L. anatomicus*) is distinguished from the foregoing by the marked difference which exists between the two extremities of the body. It may be noted that in works on Biology by Huxley and Martin, Lloyd Morgan, Harvey Gibson and others, the common worm is selected as a type. Differing widely in external appearance from the foregoing, is worms bears the name of Allolobophora, and is by no means rare. In similar situations, and on the margins of ponds, tarns and lochs, a curious and instructive worm with a square contour (*Allurus tetrædrus*) (Fig. 89), instead of a round or oval shape, is often met with. I have taken it plentifully in May near Carlisle, along with other worm-like creatures which love the same locality, but have a flat ventral surface and a suctorial organ on the posterior as well as the anterior extremity, showing that they belong to sub-class Hirudinea, which contains the leeches or suctorial annelids.

When the collector has exhausted his hunting-grounds he may turn with some amount of hope to the green-houses and hot-houses of his friends, and if these are frequently receiving new consignments of foreign plants there is little doubt but that in a short time

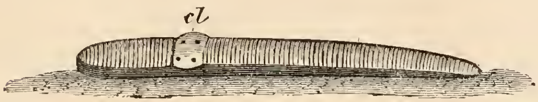


Fig. 89.—*Allurus tetrædrus.* A square worm found under stones by streams and ponds. × 2. *cl*, clitellum.

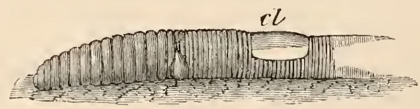


Fig. 90.—*Allolobophora Boeckii.* A round worm in similar places; greenish. Head × 3.

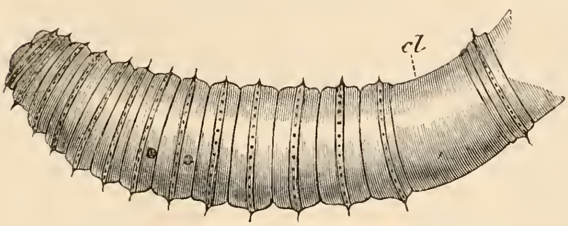


Fig. 91.—*Megascolex* (?) found at Kendal, in greenhouse.

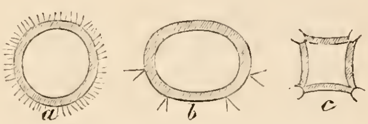


Fig. 92.—Diagrammatic sections of *Megascolex* (*a*), *Lumbricus* (*b*), and *Allurus* (*c*), all from preserved specimens in the author's collection.

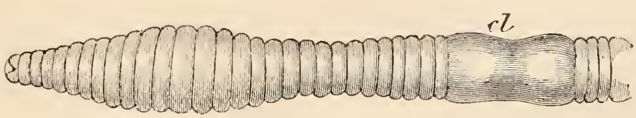


Fig. 93.—*Lumbricus terrestris* (common Earthworm). × 2.

the pretty Brandling (*A. fœtida*), a favourite bait for trout. The colour is a ruddy brown, with alternate bands of yellow, and when the animal is disturbed or placed in spirits it exudes a pungent yellow fluid of a striking character. The fluid which some other worms are able to produce is sometimes pure white (*A. mucosa*); and the whole subject of worm fluids is worthy particular attention, as it would seem that the power to exude such a protective material is analogous to the ability to make a more enduring protection in the shape of shells and cases on the part of other annelids.

The worm-hunter will turn over every likely stone or rubbish heap which comes in his path, and in so doing will be sure to meet with some interesting prizes. By the sides of streams there are numerous semi-aquatic worms of a more stunted form than that which the earth-worm usually assumes. One of these

some new form will present itself. I have in such places procured specimens of a very curious worm of a stiff habit, defiant disposition, and with a quite un-English air (Fig. 91). The special peculiarity of this genus (*Megascolex*), so far as external characteristics are concerned, is the arrangement of the setæ or bristles, which form a perfect ring or whorl around each segment of the body (Fig. 92 *a*). And here, in conclusion, it may be as well to note that the arrangement of setæ is a feature which readily lends itself to the discrimination of genera, and as it usually accompanies other generic characteristics, it is frequently referred to by systematists as one of the external notabilia. If the earth-worm, for example, be examined it will be found that there are eight bristles on each segment, which are arranged in pairs on the ventral half of the body. In Allurus the spines are arranged in pairs on the four angles of the square-shaped body, while they are about equidistant on both ventral and dorsal surfaces in Allolobophora. This latter arrangement leads the way to Megascolex, where the setæ are found all around the segments, but more numerous than in the last genus. For the internal characteristics reference must be made to the papers of Beddard, Benham and others; while the chatty paper of the late Frank Buckland, in his "Natural History of British Fishes," may appropriately be read as a sequel to the foregoing. I give a list of the species and localities, which form the critical apparatus for this article, elsewhere.

Carlisle.

ASTRONOMY.

By John Browning, F.R.A.S.

IN his annual report of the Paris Observatory for 1889, which has just been issued, Admiral Mouchez states that the building for the equatorial coudé has been completed. The instrument, which has a focal length of eighteen metres, is to be used both for spectroscopic and photographic work. Five more observatories have promised to take part in the photographic survey of the heavens.

At the meeting of the Royal Astronomical Society held on May 9th, a paper by Professor G. Davidson was read on the "Apparent Projection of Stars on the Bright Limb of the Moon at Occultations." In this paper he expresses an opinion that the phenomena observed may be accounted for by the enlargement of the images of bright objects due to unsteadiness of the atmosphere.

Mr. Knobel stated that he had recently visited the Observatory at Potsdam, and he had there seen the first photographic telescope which has been finished for the purpose of making the survey of the heavens as recommended by the French Congress. Dr. Vogel had within the last month observed that the lines in the spectrum of Alpha Virginis are doubled at intervals of two days, which shows that the star is a close double, the components revolving about their common centre of gravity in four days.

It is said that a remarkable meteor, emitting sparks, and having a comet-like tail, passed over a good part of the State of Iowa between five and six P.M. on the 8th of May. Its passage was accompanied by a hissing, rumbling noise, which caused people to rush out of doors, thinking it an earthquake. The meteor exploded about eleven miles north of Forest City, Winnebago county, and its fragments were scattered over the ground. One of these weighs 104 lb. The stone is porous, of a grey colour, spotted with brown or black, and speckled with meteoric iron. Analysis shows it to contain silica, iron oxide, aluminium oxide, lime, and magnesia.

There will be no occultations of stars of large magnitude, nor any astronomical phenomena of popular interest, during July.

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for July.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	2	2 35M	10 37M	6 39A
	9	2 45M	11 0M	7 15A
	16	3 18M	11 34M	7 50A
	23	4 6M	0 10A	8 14A
	30	5 2M	0 42A	8 22A
Venus ♀	2	6 43M	2 26A	10 9A
	9	7 5M	2 32A	9 59A
	16	7 26M	2 36A	9 46A
	23	7 47M	2 39A	9 31A
	30	8 7M	2 41A	9 15A
Mars ♂	2	4 59A	8 57A	0 59M
	9	4 33A	8 30A	0 30M
	16	4 10A	8 6A	0 5M
	23	3 51A	7 44A	11 37A
	30	3 34A	7 25A	11 16A
Jupiter ♃	2	9 42A	2 13M	6 39M
	9	9 13A	1 42M	6 7M
	16	8 43A	1 11M	5 35M
	23	8 14A	0 40M	5 2M
	30	7 44A	0 9M	4 30M
Saturn ♄	2	8 19M	3 30A	10 41A
	9	7 56M	3 5A	10 14A
	16	7 32M	2 40A	9 48A
	23	7 10M	2 16A	9 22A
	30	6 47M	1 51A	8 55A

Mercury will be a morning star until nearly the end of the month.

Venus will be an evening star in Leo.

Saturn will be an evening star in Leo.

ON THE COMMON WASP, CHIEFLY AS COMPARED AND CONTRASTED WITH THE HIVE-BEE.

By J. Yates.

WASPS only live from day to day, from hand to mouth; they daily nourish their young with nectar and the sugary syrup of fruit, to which they add the necessary animal diet by masticating flesh, and extracting its albuminous or nitrogenous juice.

Honey and syrup are chiefly used for the purpose of generating heat, and for the development of force, but the nitrogenous matter is especially intended for the building up of the tissues of the various organs of the body.

There is a remarkable contrast between the nutritious functions of the bee and those of the wasp.

Though the bee (the worker), gives minute particles of pollen mingled with honey to the young, yet the greater portion of the pollen, their nitrogenous food, undergoes an elaborate process of digestion in the system of the foster-parents before it is administered.

As pointed out by Mr. Cheshire in his work "On Bees and Bee-keeping" (chapter 6), the neuter possesses a very complicated system of glands, which are situated in its head immediately beneath the compound eyes; these glands terminate in ducts which open on either side the root of the tongue.

He seems to have made out most satisfactorily that the function of these special glands is to secrete the so-called royal jelly.

The possession of this specialised system of glands denotes a higher organisation in bees than in wasps, yet after all the wasp gets his nitrogenous requirements in a simpler way, namely, by capturing insects, and by robbing the butcher.

The royal jelly is administered to the young much in the same ways as pigeons exercise when feeding their young.

Moreover, the queen is fed by her attendants in the same way with the same royal repast.

How much she requires such highly-stimulating and nourishing food, and what tissue-forming power it possesses, may readily be estimated from the fact, that the queen, during the height of the season, will, under its influence, lay from 2000 to 3000 eggs a day, and from the fact that the sum-total of these eggs amounts to two or three times the weight of their mother.

As previously mentioned, bees and wasps possess the power of altering the sex of their offspring at will —this is accomplished by administering this royal jelly in greater or less proportion to the larva.

In early spring and summer wasps manufacture (so to speak) only neuters; in autumn they metamorphose the eggs into fertile females and males for the continuation of the race.

Now and then both wasps and bees make a slight miscalculation in the quantity of royal jelly to be administered. They give too little to metamorphose the larva into a queen, and too much for an ordinary neuter; the result is that a partially sterile female is ushered into the world.

This benighted female persists all her life long in laying eggs which produce males or drones only.

A case of this kind occurred this year at Madeley, in a hive belonging to Mr. Piercy; in consequence his hive became almost filled with useless drones. In this emergency, the Rev. G. Baily was called in, and he happily succeeded in getting rid of the nuisance.

Probably it will be asked by many, how have these curious facts been made out (if facts they be), since bees and wasps have troublesome stings, and hide their nests out of sight?

In my youthful days I made an experiment in search of knowledge on the subject. I took a wasp's nest and placed it in a comfortable chamber beneath the ground of my father's garden.

I made a good roof, and a good entrance to the room; but it was an experiment of ignorance. The only result was that our house, in the course of a few days, was crowded with an extra supply of wasps, much to my mother's annoyance; but I did not tell her the reason why.

On the other hand, M. Reaumur, in the true scientific spirit, took wasp's nests for observation—he was careful in taking nests only recently made, and he was especially careful in including the queen-mother; he then placed the whole vespiary beneath a glass hive, and was rewarded for trusting in the insect's love of her offspring by seeing her take kindly to her new home.*

Under such advantageous circumstances he watched the development of the family and the domestic economy of the commonwealth.

He watched the manufacture of the paper-covering, and by occasionally snipping away a portion of the covering, he saw the cells in the act of being moulded and fashioned before his eyes, and as tier after tier arose, he witnessed the mode of their enlargement, and he witnessed the building of the pillars and columns which fastened them together.

He saw the mature wasps of all sexes, whose duty it was to remain at home, impartially fed on the flat roof of the comb on the juicy food which their comrades, the working foragers, had just regurgitated for their benefit, while other foster-parents fed the larvæ in the cells below.

The extraordinary tenacity and strength of the cord which fixes the whole vespiary to the summit of the roof of the nest may be estimated by the great weight it has to bear.

The largest nest I ever assisted in taking had from twelve to fourteen combs, at least a foot in diameter, and the whole was not less in size than the ordinary straw hive of the bee, and, when filled with young wasps, must have weighed many pounds.

As the wasp is one of the Hymenoptera which only possesses a short tongue, it cannot gather nectar from long-tubed flowers, as bees and bumble-bees do. It feasts chiefly on umbelliferous plants, among which I have observed that it is especially fond of the wild parsnip; it also feeds and gathers nectar bountifully from the knotted and water figwort,† aided by the corolla in these plants being shallow, and nearly full of honey.

In early spring the flowers of the rhododendron are especial favourites; late in autumn swarms of wasps may be seen sipping the scanty nectar, and eating the copious pollen, of the ivy; the last food ere they die.

When I was a boy I made a notable and curious discovery as regards the character and conduct of wasps. My brothers and myself were taking one of their nests in the middle of a grass field; when we had dug out one or two spadefuls of soil the communication with the nest was lost, and while we

* That wasps are capable of some amount of civilization may be readily admitted when we consider the behaviour of the wasp (*Polistes gallica*) which Sir J. Lubbock brought from the Pyrenees. It would feed quietly on his hand, and would return to the bottle in which it lived after daily excursions. He kept it nine months.

† *Scrophularia nodosa and aquatica.*

were seeking to find the entrance, the wasps who had been out on foraging expeditions began to return. We were speedily surrounded by a great multitude of them. At first we beat them away with boughs, but when we found they made no attempts to molest us, we let them alone in wonder. Evidently they were so occupied with the endeavour to find their nest, that no provocation would drive them to sting us, but as soon as the passage leading to the nest was reopened, out came the wasps in fierce anger, and we all speedily got stung.

Until a few days ago I thought this was an original discovery of my own; but, alas, there is nothing new under the sun. I find a Mr. Knight made the same discovery and recorded the fact in the Philosophic Transactions for 1807.

(*To be continued.*)

SCIENCE-GOSSIP.

On June 14th the members of the Essex Field Club and the Ipswich Scientific Society, to the number of about one hundred, had a capital field day on the rivers Orwell and Stour, in Suffolk. The excursion was under the direction of Dr. J. E. Taylor and Mr. E. A. Fitch. The party hired a steamer, and had some remarkably good dredging. The Orwell is especially rich in sponges, hydrozoa, and polyzoa, as well as crustacea. Dr. Taylor gave an address on board the steamer "On the Estuaries of the Orwell and the Stour."

The first two numbers of "British Cage Birds," by R. L. Wallace, and published by Upcott Gill, are to hand. They are extremely well illustrated (plain and in colours), and are to be had at the modest price of sevenpence a number.

The same remarks apply to "The Canary Book," by the same author and publisher, the first two numbers of which are before us.

Mr. James Johnson sends us his two pamphlets "The Ether Theory of 1839 is the true Theory of the Leyden Jar," and "Facts which prove that the Two-Force Theory of Electricity is True."

The editor of the "Naturalist's Gazette" has sent his interesting and amusing little "Naturalists' Calendar and Weather Guide," which contains much of the old folk-lore with regard to the weather.

The last number of "The Asclepiad" contains the following articles:—"Asphyxia, Apnœa, and Syncope of the Lesser Circulation," "The Hypnotic Epidemic," "Opuscula Practica," "William Cullen M.D., and the growth of Physical Medicine" (two portraits), "The Physiological Properties of Nitrate of Amyl," "Contemporary Practice and Literature," &c.

We are sorry to see that "Research" is to be discontinued, after having completed its second year of an active and promising career.

We deeply regret having to chronicle the death of an old contributor and a dear personal friend, Mr. John Gunn, M.A., F.G.S., of Norwich, at the ripe age of eighty-nine years. He was eminently known by his numerous writings as the "Norfolk Geologist." His splendid collection of mammalian remains from the forest bed, the crags, etc., were presented by him to the Norwich Museum, where they are arranged in the "Gunn Room."

"Jeyes' Disinfectant Fluid" has, by a proclamation just issued in the "Hong-Kong Government Gazette," been authorised by the Acting Colonial Secretary for use on board the Chinese passenger ships.

No. 1 of "Le Diatomiste" promises well. It contains two excellent plates of diatoms, with detailed descriptions of the species, besides other interesting matter. The editor, Mr. J. Tempère, intends to publish it every three months. Our English readers can obtain it at Mr. W. P. Collins', 157, Great Portland Street, W.

A careful and correct local flora is always useful and interesting; we therefore welcome Mr. W. T. Haydon's "Catalogue of the Flowering Plants, &c., found in Dover and its neighbourhood."

Mr. T. D. A. Cockerell is contributing an interesting series of "Notes on the Insect Fauna of High Altitudes in Custer County, Colorado," to the "Canadian Entomologist."

A "Popular Natural History of Gloucestershire," edited by W. B. Strugnell and C. A. Witchell, assisted by numerous contributors, is in course of preparation; and, from the list of the contributors, promises to be a success. It will be published in eight or nine monthly shilling parts, or, when completed, may be had in one volume for 10*s*. 6*d*.

At a recent meeting of the "Paris Academy of Sciences," M. Perrier proposed the following artificial sea-water for marine aquariums:—Sodium Chloride, 81 grammes; Magnesium Sulphate, 7 grammes; Magnesium Chloride, 10 grammes; Potassium Chloride, 2 grammes; dissolved in 3 or 4 litres of water. He stated that he had found this particularly good for oysters.

At the same meeting M. Stanislas Meunier mentioned the formation of a tin ore in the hot spring of Azer-Panas in Malaysia. This is interesting as being the first case known.

The editor of the "Naturalist's Gazette" has in the press an "Illustrated Handbook of British Dragon-flies," which will contain a full description of all the species indigenous to the British Isles, in addition to a quantity of other information. Its price will be 2*s.* 6*d.*, and it will be published by the Naturalist's Publishing Company, Birmingham, from whom full particulars may be obtained.

"By Sea and Shore" is a promising little magazine of natural history brought out in the interests of the Scientific Society at Rossall School.

The next British Association Meeting takes place at Leeds, commencing Wednesday, September 3rd, under the presidency of Professor Abel.

We have before us a full and carefully got up list of "The Land and Freshwater Mollusca of Ingleton, Clapham and District," by W. E. Collinge. Local conchologists will doubtless appreciate this useful little catalogue.

It is with much regret we have to chronicle the death of Mr. W. G. Dallas, F.L.S., the active secretary of the Geological Society, at the age of sixty-six. Mr. Dallas was a well-known writer on geological and natural history subjects, and for some years was editor of the "Popular Science Review," and up to the day of his death was one of the editors of the "Annals and Magazine of Natural History."

MICROSCOPY.

A New Clearing Agent.—Many who have employed carbolic acid in mounting will have found that when Canada balsam is applied to the object, a milkiness sometimes appears which spoils the mount. This may be obviated by adopting the following procedure. After treating the object with pure carbolic in the way described in several journals (see especially Science-Gossip, 1875, p. 229, and 1880, p. 137; the "American Monthly Microscopical Journal," 1883, p. 8; also "Lee's Microtomist's Vade-Mecum," p. 216), drain off the superfluous fluid, and transfer the object at once to a clearing agent, consisting of equal volumes of pure carbolic acid and spirits of turpentine. The two must be intimately mixed by shaking in a phial, after which pass the fluid through a filter, and cork and keep the solution for use. The object may be placed in the clearing agent in a watch-glass, or a sunk cell; but if it is small, it is better to keep it on the slide under a cover glass, and to run the carbolised turpentine through in the usual way, drawing it off with pieces of blotting- or filter-paper. If any milkiness appear, wash it away with repeated applications of the solution. When clear, drain off the superfluous fluid, taking care not to let bubbles form, and then mount in balsam. Gruebler's balsam in xylol, put up in collapsible tubes, is, I find, the best for the purpose. If any of your readers will but try carbolised turpentine as an adjunct to the carbolic process of mounting, they will probably adopt that process in preference to all others for balsam mounts. I have used carbolised turpentine in the way described for some three years, and therefore have a fair experience of it.—*W. J. Simmons, Calcutta.*

New Slides.—We have received from Mr. Ernest Hinton, 12 Vorley Road, Upper Holloway, a couple of unusually interesting and very neatly mounted slides. One is a superb specimen of the common freshwater alga *Spirogyra communis*, in the act of conjugating. Nothing could more clearly bring home to the mind of the botanical student the nature and process of this important act. The second is a slide of *Nitella flexilis*, showing even more plainly than any emphasised wood-cut could the *Antheridia*. The latter are naturally orange coloured, and they contrast strikingly with the green vegetative filament. The latter is best seen with the paraboid.

Preservation of Melicerta Ringens.—My attention having been called to the note of F. N. Measures, on the preservation of *Melicerta ringens*, I beg to say that I have had melicerta for over twelve months in glass jars which I use as miniature aquariums. It was introduced on the *Anacharis alsinastrum*. But having neglected the jars they got over-stocked with anacharis, nitella, and minute algæ; and as far as I can ascertain they have completely disappeared. The following note from my note book may be of some interest to your readers. A friend of mine kept an aquarium for some years, the sides of which were covered with algæ. We scraped some of it off, and an examination revealed the following interesting objects:—*Floscularia* (probably) *ornata*, *Tardigrada*, *Stylonichia*, *Epistylis*, *Chætonatus larus*, *Salpina redunca*, *Monocerca rattus*, *Cothurnia imberbis*, *Euplotes patella*, besides a large number of objects which we were unable to identify.—*H. French, Sunderland.*

ZOOLOGY.

Annelids of Cumberland and Westmoreland.—The following list seems necessary as a sequel to my remarks on another page ("A Chat about Worms"). I have collected the whole during the present year, and have had the opinion of experts in reference to critical species:—*Sabellaria crassissima*, Lk., *Terebella littoralis*, Dal., *Serpula triquetra*, L., *Serpula contortuplicata*, L., *Spirorbis nautiloides*, Lk., *Spirorbis lucidus*, Mont., *Arenicola piscatorum*, L., *Nephthys longisetosa*, Œrsted. The foregoing are all from Silloth, the latter being known by the fishermen as the "White worm," and thrown aside as useless when they dig for bait. *Perichæta indica*, Horst., found in a greenhouse at Kendal; *Allurus tetraedrus*, Dugès, from River Eden and Monkhill Loch; Brandling (*Allolobophora fœtida*, Benham

= *Lumbricus olidus*, Hoffm.) and *Allo. mucosa*, Eisen, from Kendal; *Allo. chlorotica*, Ben. (= *Lumb. riparius* and *L. viridis*), *Allo. turgida*, Eisen; *Allo. longa* (Ben. ?), from the River Eden at Carlisle; *Allo. celtica*, Rosa, from a stream near Langholm, N.B.; *Lumbricus agricola*, Hoffm. (= *L. terrestris*, Linn) or common earthworm, generally distributed. There are a few other representatives of the group which were too immature when I collected them, but which I hope soon to find in a recognisable condition and add to the list. The leeches have not yet been carefully worked, but I have found the following all in one locality (Monkhill Loch), and have others yet to record: *Nephelis octoculata*, L., *Clepsine sexoculata*, Moq.-Tandon, and *Clepsine bioculata*, Müller. It is curious to observe the eggs and embryos attached to the ventral surfaces of these peculiar creatures.—*Hilderic Friend, F.L.S.*

British Hydrobiæ.—In my contribution on the distribution and habits of the British Hydrobiæ in the May number of Science-Gossip, page 105, the proposed non-carinate variety of *H. Jenkinsi* has been incorrectly described as var. *A. carinata* instead of, var. *A. ecarinata*. The synonyms should read as follows: *Hydrobia Jenkinsi*, E. A. Smith; syn. *H. ventrosa*, var. *carinata*, Marshall; var. *A. ecarinata*, Jenkins; = *H. ventrosa*, var. *ovata*, Marshall (non Jeffreys). The figures of the shells of *H. similis* are enlarged quite three diameters, the other figures being enlarged a little over two and four diameters, as previously stated. Adult shells of the above species in my collection measure four and three-quarter mill. in length by three and a quarter mill. in breadth, and correspond almost exactly with the dimensions of *H. similis* given by Forbes and Hanley in their work on British Mollusca and their shells. Since I wrote the above account of the Hydrobiæ, specimens of the Plumstead-Becton type, which I have kept alive and vigorous in hard tap-water for eighty-four days, have largely reproduced their species, and the young Hydrobiæ, which seem to be brought forth alive, are as active as their parents, and grow with amazing rapidity. Other specimens of the same species are also breeding freely in aquaria supplied with pond water. At present I have not succeeded in getting young Hydrobia from either *H. similis* or *H. ventrosa*. —*A. J. Jenkins.*

How Deep do Hybernating Mulluscs Burrow?—Like Mr. L. E. Adams, I have often vainly dug and searched for land and freshwater molluscs during the winter. During this last winter, however, I have been rather more successful than hitherto, and a few notes on my finds may perhaps be of interest to Mr. Adams and others interested in the habits of the mollusca. From observations made I am of opinion that a number of the larger land-molluscs do not generally burrow into the earth during hybernation, but attach themselves to flower-pots, stones, etc., in out-houses and elsewhere and in the trunks of hollow trees. I have found *H. aspersa*, *nemoralis*, *hortensis*, *arbustorum*, *Cantiana*, in such localities in large numbers. *H. rufescens* I have frequently met with at a depth of five to six inches below the surface, sometimes under piles of stones; I have also found this species, together with *Hyalina nitidulus*, in the trunk of a hollow tree. In the district of Collingham Bridge, Wetherby, and Boston Spa, *Cyclostoma elegans* is very plentiful, but I have never found it any lower than three to four inches. Regarding the freshwater mollusca, the *Sphæriidæ* burrow to the greatest depth of any I have as yet seen. *S. corneum* and *lacustre* I have taken in hard mud thirteen and fourteen inches below the surface. *P. contecta* and *Bythiina tentaculata* I once collected at a depth of about twelve inches, but this was during the summer. Some two or three years ago I collected specimens of *L. truncatula* on Clapham Common, N. W. Yorkshire, in a dried-up pond quite eighteen inches below the surface. A point of great interest to me is how these molluscs, *e.g.* the *Sphæriidæ*, manage to extricate themselves, as it is with some difficulty that they manage to get through three or four inches of fine mud. The subject is one of great interest, and I trust further communications will be published from other observers.—*W. E. Collinge.*

Grey Plover.—About ten days ago a fine specimen (female) of the Grey Plover (*Squatarola Helvetica*) was killed by flying against the telegraph wires two or three hundred yards north of this town. As the breeding ground of this bird is on the tundra of Northern Siberia, it is curious that it should have found its way here so late in the season. The bird is now in the hands of Mr. W. Norman, of this town, for preservation.—*Joseph P. Nunn, Royston, Cambs.*

BOTANY.

The Orchid and Isosoma.—The insect referred to in Science-Gossip for April, p. 95, by your correspondent as affecting *Cattleya*, is without much doubt the *Isosoma orchidearum*, belonging to the hymenopterous group Chalcididæ. This species was described by Westwood in "Trans. Ent. Soc. London," and is also mentioned by him in "Gardeners' Chronicle," 1869, p. 230. Mr. E. A. Fitch ("Ent. Soc. London," May 7th, 1884) records the same insect from Southport, Lancashire; and in "Insect Life," 1890, p. 250, a variety of the same is reported from Massachusetts, U.S.A. Other species of the genus, *I. hordei*, Harris, and *I. tritici*, Riley, are injurious to cereal crops in America. The genus *Isosoma* is of very exceptional interest as being a plant-feeding genus in a family consisting almost entirely of species parasitic on other insects.—*T. D. A. Cockerell, West Cliff, Colorado.*

ARUMS AND FLIES.—About a fortnight ago a plant of *Arum Crinitum* flowered in my greenhouse. The weather was hot, and the odour of the flower was correspondingly powerful, and compelled me to choose between withdrawing myself or expelling the plant from the house. I chose to do the latter. The odour closely resembles that of putrid flesh. The plant was not out many hours before numbers of blue-bottle flies collected upon it and upon the woodwork of the house close to which it stood. They swarmed upon the spathe, carefully trying every square line of it with their protruded proboscides, only to find that the powerful and, to them, doubtless appetising odour, proceeded from nothing which could allay the cravings excited by it. I think their size prevented them from passing down through the constricted part of the spathe to the locality of the stamens and pistils ; but, learning nothing from their own disappointment in the matter of food, or perhaps believing that the good things lay where they could not penetrate to, these stupid or credulous flies deposited large quantities of eggs in the narrower portion of the spathe. In a few days these eggs produced a swarm of maggots, which of course speedily perished —the victims of the too successful fraud practised upon their parents.—*James Bellas.*

OPHRYS ARANIFERA AND ITS REPUTED VAR. FUCIFERA.—This species is very variable, ranging in height from three inches to eighteen inches, according to situation ; warm, sheltered spots under banks and cliffs generally producing the finest plants. The usual height is from seven inches to nine inches. The number of flowers varies from two to fifteen, or more, the usual number being from seven to nine. The flower is variable in shape, the labellum in some specimens being almost round, with the other petals and sepals very short and broad. In others, the flower is much elongated, the labellum being twice as long as broad, the other petals and sepals very long and narrow ; these are the extreme forms, and between them is found the normal type. The colour of the labellum varies from a bright chocolate to a deep dark brown, the "markings" also varying in intensity of colour, as also in shape. Again, in some flowers the labellum has on either side a conical projection termed "lateral humps," similar to those of *O. apifera*, thus dividing the labellum apparently into three parts; in others these projections are wanting, and the labellum is entire. The two petals are usually strap shaped, but are sometimes broad near the base, become narrow somewhat suddenly, and have a wavy margin ; these petals are usually of a pinkish hue, the strap-shaped specimens being generally yellow-green. The Rev. G. E. Smith, in his Catalogue, 1829, after describing a number of specimens collected from various localities, writes as follows : "I then concluded that the Fucifera and Aranifera must be the same species ; and this conclusion is stronger upon an inspection of the Aranifera of Oxfordshire, of many figures, and especially of the figure in Flora Lond. t. 67, and Vaillant Bot. Paris, t. 31, f. 15, 16. These observations are now offered to attract further attention to the subject, and in due respect to the decision of Sir James Smith. It is possible that the two species occur together and have mingled." . . . The Rev. Smith wrote the preceding on observations made during one year only ; I have examined, during ten years, many hundreds of plants growing on the downs and cliffs, from Kingsdown on the east to the hill above the water-works, Folkestone, on the west, and have never found a specimen that could not be referred to *O. aranifera ;* not even a plant that might be regarded as a sub-species. I have inquired of botanical friends, who know the plant and localities well, and none can refer me to anything different from the plant already described. I endorse the Rev. G. E. Smith's opinion, and emphatically declare that there is no plant growing between the localities mentioned that cannot be referred to *O. aranifera.* Unless some better and well authenticated specimens can be produced than have already appeared, the continuation of *O. fucifera*, even as a variety, is a mistake, and very misleading.—*W. T. Haydon, Dover.*

GEOLOGY, &c.

THE EVOLUTION OF CLIMATE, Professor J. Geikie ; Climate and Cosmology, Professor J. Croll. —These two eminent scientists have written much on this abstruse subject without reaching a satisfactory conclusion. I find in the *Times* of 13th September, 1889, a report of the address of Mr. J. Geikie to the Geological Section of the British Association, when he said : "It cannot be denied that our knowledge of Palæozoic, Mesozoic, and even early Cainozoic climates is unsatisfactory." So, in the above reprint he reconsiders the subject on "the modern doctrine of the permanency of continental and oceanic areas." At page 3 he defines these as a vast water region where "depression has exceeded elevation," and great land areas where "elevation has, upon the whole, been in excess of depression." In these definitions he destroys the permanency, without attempting to give a limit to either depression or elevation. At p. 11 he allows "oscillations of level," with land "gradually extending," "and the sea disappearing from wide regions which it had formerly covered" ; and he thinks "that the seemingly gradual change from tropical to temperate conditions was due in large measure to that persistent continental growth." He is then puzzled about the glacial period, telling us (p. 13), that many geologists had tried to explain climatic changes, "but all these attempts had failed." He then refers to James Croll (p. 13). After allowing that climatic changes depended on "the relative distribution of land and water," he "cannot help agreeing with Dr. Croll that the warm climates of the Arctic regions during that era (Pleistocene or Glacial) were to some extent the result of high eccentricity" (p. 20). His geographical condition was brought about by the upheaval of land. Here we close with Dr. Geikie's public papers, and refer to a private note to me, dated 21st November, 1889, replying to one from me objecting to his upheaval cause for the climate changes under discussion: "You will get no sane geologist to agree with you." In the same note he allows that as the land in old times was insular, "warm currents found ready access into polar regions." This latter action is quite natural, and these currents gave all the warmth that the frigid zone ever enjoyed, except that direct from the sun in the short summer. The only difference between us is, the Professor stops the currents by "elevation" of land, I stop them by the local sinking of his region, where "depression has exceeded elevation." I have told him that there is no measure of depression, but that the sea has sunk by that action, and left the land as it is. I now come to Professor Croll, only as touching on the point of controversy. Geikie quotes him, and accepts his theory of eccentricity; therefore Croll is a "sane geologist" in Geikie's opinion, and I may quote him in support of a non-upheaval system. At page 267 he tells us, "valleys have not been produced by violent dislocations, nor the hills by upheaval." If, as Professor J. Geikie allows, the ocean-bed is a depressed area, then, as he also allows, the water must have been drawn off the lands, the channels by which the warm tropical streams reached the Arctic regions must have become closed, and his insular geographical condition must have been turned into continental conditions; therefore it became cold where it had once been warm, and life became extinct. Nature has not two laws to effect one action.—*H. P. Malet.*

Mr. Boverton Redwood recently read a paper on the "Petroleum Fields of India" before the Society of Chemical Industry. These fields occur in Burmah, Assam, the Punjaub, and Beloochistan. Perhaps the most valuable fields are those of Ramri and the Eastern Baranga Island (two of the Arakan group), Khatan, where the annual supply of oil is 50,000 barrels, and Yenangyoung, where the oil yields a large percentage of paraffin.

A Boulder's Tale.—How got the apples in? was the inquiry of an august personage when confronted with some apple dumplings. How got the boulder there? is the natural question of speculative geologists when first brought to contemplate such mammoth specimens as ornament Borrowdaile and Wythburn Valley. Now without for a moment attempting to controvert the received theory of glacial action, which ostensibly has been a great power in these valleys, we may venture to draw attention to what is actually going on at intervals in the nineteenth century. A boulder recently descended from the south side of Helvellyn, as seen from the opposite side of Wythburn Valley. Rather more than a year ago four men were playing a game at cards in the cottage at the left-hand corner of the sketch sent, when they heard a roaring noise like thunder, which suddenly ceased. In the morning the stone itself was found tilted on end in the grass above the cottage. Fortunately for the inmates, there is a slight ridge on the mountain side just here, which checked the rolling of the mass of rock. One of the edges must have stuck in the soft ground, and thus the stone was arrested. This block had fallen, after a slight frost, from the cliff shown in the upper part of the sketch. It is situated a few yards south of Wythburn Vicarage, so that tourists between Grasmere and Keswick can verify the above for themselves. It is needless, perhaps, to add that if this stone, which must weigh at least a hundred tons, had gone through the cottage, no one would have been left to tell the tale. However, the boulder tells his own tale, and answers the question given above—"How got the boulder there?"—*S. Barber, Wythburn.*

NOTES AND QUERIES.

Dyticus Marginalis.—I have several specimens of *Dyticus marginalis* in confinement. I feed them about once a week with raw meat. If I don't change the water after I have fed them, it becomes turbid and milky; but I don't think the water should be changed too often. What should I do, and what mollusc could I put in to keep the water pure, as they have devoured up till now three kinds of Lymnæus, four of Planorbis, and one Pisidium. I don't see how it would matter the water being putrid, as the water of the Kentish dykes, where I got them, smells very badly of putrid substance—*G. W. Kirkald (Jckay).*

Tenacity of Life in a Cat.—The following singular case of severe mutilation of a cat, which it survived for several days, may interest your readers. A cat in my possession, aged eight months, was in the habit of sleeping in a box of straw placed in a shed at the bottom of the garden; it was very tame and gentle, and showed much affection for myself, and invariably accompanied me when in the garden. A collie dog also was in the habit of attending my operations—dog and cat occasionally relieved the monotony of watching me by having a little play together, being on the most friendly terms. On Tuesday morning, 6th inst., I was surprised to find only the dog waiting for me, and supposed the cat had slipped indoors. On inquiry I found she had been last seen on Monday evening. On my return home on Tuesday I carefully examined her sleeping-box and other places, hoping to find her, but in vain. Wednesday morning on looking into her box I was much surprised to see her in it. On being touched poor puss gave a faint cry, and I cannot express how shocked I felt when on careful examination I found her right foreleg clean gone, pulled straight away from the shoulder-blade, leaving the socket exposed, and a dreadful wound about two inches in diameter; the flesh had dried, and no blood was visible. She drank some milk with avidity, and during the day took bread-and-milk, and did not appear to be in pain. Friends counselled her being drowned, but when a family council was held to decide the case, poor pussy began to purr, and that decided the verdict in favour of her life being spared—she even attempted to play with a bit of string. For several days she was quite cheerful and ate well, but at last the wound seemed inclined to suppurate, and moving about seemed too much exertion, and I felt it a duty to close what, after all, could only have been an unhappy life. What seems so extraordinary is that a cat having had an entire limb torn off its body, should not have bled to death, and what is very annoying is that no clue has been found to the occurrence. Perhaps your readers can throw some light, or parallel the circumstance from some similar case, observed by them. There were no marks of any injury such as would be caused by a bite; and the cat showed no aversion to the collie, who endeavoured to show his sympathy by licking the wound.—*F. Le-B. Bedwell.*

NOTES IN NEW ZEALAND.—I am sorry to say there are not many contributors in New Zealand to your pleasure-giving and instructive paper, so that fault-finding is most painful, but when one sees a letter like that from R. N. H., of Kohimarama, one cannot help wondering what his particular affliction may be. The English birds do increase most marvellously in this sunny climate, and there are many who have spent, and more who would spend, money, seed, time, and labour, rather than not hear the little birds' sweet songs, and be reminded of the old days at home. I differ with R. N. H. too, by believing the balance of nature to be preserved, not upset, by introducing birds. Years ago our crops were always in danger of being destroyed by a plague of caterpillars: since their enemies the birds came it is only occasionally we hear of a crop being destroyed, and in time they will disappear. Farmers do sow a little poisoned grain sometimes, but few would care to have the birds exterminated. My advice to your correspondent would be to sow a handful or two more seed to the acre, and if he is not deaf, he will be rewarded by the grateful songs of the skylark and his friends. It is the importing of these birds too that in another way preserves the balance of nature, for our native birds are fast disappearing. Most of them are honey-feeders, and I fancy the bees (imported) have helped to kill them by using their food, and also by stinging, particularly when the cup-like flowers of the flax (*Phormium tenax*) are filled with honey, and a long tongue is poked in among the stamens, to the annoyance of the bee that was first there. Just after writing the above a neighbour dropped in who said that he had watched for two or three days a number of larks, English and our native lark, *Anthus novaz*, busy upon some newly sown grass seed, and at last he shot two of them. He opened them, but failed to find a single grass seed, but plenty of insects and larvæ. So you see even a lark may get a bad name without being guilty: 'tis hard he must be shot to prove him innocent.—*J. W. Baker.*

REDSTART IN WINTER.—Surely the birds mentioned by Mr. Blaby on p. 143 were specimens of the black redstart, which is a winter visitor to our south-west coasts, and may be known by its black or grey breast. We should like to know the locality.—*Rev. J. E. Kelsall.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

ANODONTA.—We cannot undertake to name Indian shells. Your varieties of *L. peregra* are (1), *oblonga*; (2), *acuminata*; (3), *labiosa*. No. 9 is *S. corneum*, probably var. *flavescens*.

G. W. H.—The "scum" on your pond is a species of freshwater algæ (*Oscillatoria*). It will do no harm to the fish, but it is a terrible plant for increasing where it finds a favourable habitat. When next you clean the pond, put a good bottom of quick lime in it whilst the bottom is muddy.

D. BUTLER.—Thanks for your specimens of the malformed fruit of *Prunus communis*. We do not think, however, that their elongated and pod-like shape has anything to do with bees crossing the flowers with the pollen of the broom. It is a well-known malformation. The single seed within shows the two cotyledons separately.

H. DURRANT.—The "dark brown stuff" forming at the bottom of your aquarium is probably composed of diatoms. This, however, you can prove by the microscope. All aquaria in which plants and animals have been very long kept, however, deposit a brown sediment, which is frequently the decomposition of the vegetable matter. The other objects you mention are probably the eggs of some species of freshwater mollusc.

"INTERESTED READER."—It is not uncommon to find primroses to have the sepals of the calyx reverted to green leaves. The remarkable fact about your specimen is, that the green calyx leaves are polyphyllous, or nearly so.

F. H. ARNOLD.—Thanks for the specimens, which shall be duly noticed.

"PEBBLERIDGE."—The fungus on the leaf of mountain flax (*Linum catharticum*) is *Lecythea lini*, Berk. It is not uncommon.

J. C. SMITH.—Thanks for your specimens of *Geum rivale*. They are exceedingly interesting. The sepals are developed into true leaves, the stamens are changed to petals, petals are all modified, and the pistils have shot up and grown into buds. Your plant appears to be *Rubus conglifolius*.

R. G. MUMBRAY.—The fossilized mass of Teredo was doubtless derived from the London clay, in some parts of which it is very common, and always associated with fossil wood. See Taylor's "Common British Fossils," p. 273.

R. COUPAR (Galway).—Williams & Norgate's address (publishers) is 14 Henrietta Street, Covent Garden, London. You should procure the "Transactions of the Chichester and West Sussex Nat. Hist. Society," and "Trans. of the Hertfordshire Nat. Hist. Soc. and Field Club," through the agency of Mr. W. P. Collins, 157 Great Portland Street, London, W.

J. HODGSON.—The fungus resembling the seaweed *Padina pavonia* is *Stereum hirsutum*.

T. A. DELCOMYN.—Mr. Mosley's address is Beaumont Park Museum, Huddersfield.

W. E. WINDUS.—The plant is the buck-bean, or bog-bean (*Menyanthes trifoliata*), common in the north of England.

W. TAPPER.—There is no doubt the "enormous vertebra" you speak of as being found in the basement bed of the red crag, near Yarmouth, is that of a fossil whale. We don't know of any red crag in that neighbourhood, however, but fossil whale's vertebræ are not uncommon in the red crag.

JAS. BELLAS.—We cannot make anything out of the worms other than the hair worm (*Gordius aquaticus*). Both specimens revived when placed in water.

EXCHANGES.

WANTED, any books on British insects; illustrated preferred. Good microscope slides offered in exchange.—H. E. E., 344 Caledonian Road, London.

SCIENCE-GOSSIP from commencement (20 vols.), handsomely bound in publishers' cases, in exchange for novels and books relating to Eliot, Brontë, and Jane Austen.—Chas. F. Bishop.

OFFERED, $\frac{1}{8}$-inch achromatic object glass, in exchange for books on entomology or the microscope.—W. F. Kelsey, Maldon.

WANTED, a first-class chemical balance with working parts of agate, and susceptible to $\frac{1}{2}$ milligramme. Also combustion furnace, potash bulbs, and any other apparatus for organic and volumetric analysis.—A. J. Doherty, 63 Burlington Street, Manchester.

FOR exchange, *Vertigo angustior* (dead shells), *Cyrena fluminalis*, *Paludina melanostoma*, *Circe minima*, *Planorbis exustus*, *Tryonia protea*, *Otina otis*, *R. cingillus*, var. *rupestris*, *Pandora*, *Scrobicularia tenuis*, &c. Desiderata, shells, British and foreign, not in collection.—Brockton Tomlin, The Green, Llandaff, near Cardiff.

WANTED, beetles, shells, eggs and butterflies, in exchange for finished fretwork tables, brackets, inkstands, photo frames, &c.—Alstead, North Street, Jarrow-on-Tyne.

OFFERED, *Limas lævis*, shells, or living animals, *Pupa ringens*, *Zonities fulvus*, &c., and sections of marine and other shells. Wanted, *Helix pomatia*, *cartusiana*, *C. rolphii*, *biplicata*, *Z. drapaaraldii*, and European land and freshwater shells. Continental correspondence desired.—F. Rhodes, 26 East View, Eccleshill, Bradford, Yorks.

IN exchange for six micro-slides I will forward about fifty specimens of animal hairs and brilliant feathers.—Arthur H. Williams, Hythe.

WANTED, any parts of Braithwaite's "British Moss Flora." Liberal exchange given in other books on medicine, entomology, travels, fiction, &c.—J. A. Wheldon, 4 Rosebank Road, Leeds.

OFFERED, sixty-three numbers of the "Quarterly Journal of Microscopical Science" (col. plates), from 1853 to 1869, mostly complete, and covering most interesting period; thirty-nine numbers of the "Journal of the Royal Microscopical Society," 2 vols. each 1880–83, with three odd numbers and two indices; "American Monthly Micro. Journal," first 4 vols. complete, and two extra numbers; "American Journal of Microscopy," first 5 vols. complete, and four extra numbers; SCIENCE-GOSSIP for 1879, &c. Wanted, Leidy's "Rhizopods," and Allman's "Freshwater Polyzoa."—J. E. Lord, 35 Bank Street, Rawtenstall.

WANTED, to exchange Berkeley's "British Mosses," Goebel's "Morphology and Classification of Plants," Behren's "General Botany," and other botanical works. Will take good Spanish or Italian Dictionary, or standard foreign literature.—J. W. B., 56 Vine Street, Liverpool.

A LARGE number of British and foreign land and freshwater shells, with localities, in exchange for microscopic slides.—L. M. Cockerell, 3 Fairfax Road, Bedford Park, Chiswick, W.

WANTED, first-class mounted microscopic objects, and books relating to the microscope or photography. Offered in exchange, two bound volumes of SCIENCE-GOSSIP for 1884–86, "Journal of the Royal Microscopical Society," for 1888 and 1889, unbound, or mounting materials and apparatus.—W. H. Pratt, 27 Regent Street, Nottingham.

WHAT offers in shells, fossils, or stone implements, for a fine collection of seeds, one thousand varieties, mounted on cards, in trays, and fitted in case.—Thomas Reader, 171 Hemingford Road, London, N.

WANTED, good unmounted material, also foreign shells, in exchange for choice micro-slides of all kinds, and British marine shells.—R. Suter, 5 Highweek Road, Tottenham, London.

WANTED, a copy of SCIENCE-GOSSIP for January, 1888, in exchange for specimens of *H. virgata*, *H. caperata*, *H. cantiana*, *V. cristata*, *L. glutinosa*, &c.—A. Mayfield, 88 Stafford Street, Norwich.

WANTED, foreign land and freshwater shells of all kinds, European species more especially. British shells given in exchange. Lists sent and received. Foreign correspondents desired.—W. I. Farrer, 15 Lorne Street, Fairfield, Liverpool.

USEFUL offers wanted for SCIENCE-GOSSIP, vols. 1875–89; years 1875–78 bound, remainder unbound, all in splendid condition.—Robt. Glasper, 8 Cambridge Avenue, Pilvig, Leith.

WANTED, well-marked varieties of sphærium and pisidium. State desiderata.—W. E. Collinge, 41 Springfield Place, Leeds.

DUPLICATES.—*C. album*, *selene*, *edusa*, *paphia*, *rhamni*, *corydon*, *lorriceræ*, *loveata*, *vespertaria*, *remutata*, *populeti*, *autumnaria*, *lariciata*, and numerous others. Desiderata, birds' eggs.—Walter Dutton, Piccadilly, York.

WANTED, living specimens of freshwater snails, and also animals, in exchange for chalk and other fossils, also mounted specimens of microzoa.—J. W. B. Rodgers, 54 London Road, Highfield, Sheffield.

MICRO-SLIDES.—Insects, mosses, hepaticæ, spiders, &c., for other good mounts; also diptera for other species, either set or in glycerine.—W. E. Green, 24 Triangle, Bristol.

WILL give rare British shells for the following foreign ones: venerupis, pectunculus, avicula, spondylus, tornatella, emarginula, trochus, fusus, scalaria, odostomia, eulima, and ovulum. Lists sent.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, Devon.

MINERALS wanted. Quartz crystals, double reflecting spars, labradorite, good specimens of copper and tin, cobalt, chalcosiderite, Derby spar, Iceland spar, needle iron ore, or any other showy mineral crystals, in return for rare and beautiful objects for mounting for the microscope, fossils, polished specimens of Devonian corals and sponges, &c. Lists sent by—T. E. Sclater, Bank Street, Teignmouth.

OFFERED, *Planorbis albus*, *nitidus* and *vortex*, *S. corneum*, var. *neucleus*, *L. stagnalis*, var. *fragilis*, var. *cristata*; also fine *P. fontinalis* and others. Wanted, rarer British land and freshwater shells, also foreign land and freshwater species.—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

OFFERED, plants of *Parnassia palustris*, which will shortly flower, also *Hydrobiæ ulvæ* and *Pisidium nitidum*. Wanted, *H. nemoralis*, reversed form, *Bulimus obscurus*, var. *alba*, any vertigos, *Unio tumidus*, and other land and freshwater shells.—A. Whitworth, 65 Talbot Street, Southport, Lancs.

To curators of museums and others.—Three collections of Australian plants, containing 320, 140, and 135 species, named and localized, are offered in exchange for shells or conchological works.—W. A. Gain, 'uxford, Newark.

WANTED, *Helix aspersa*, ar. *undulata*, and *Helix arbustorum*, var. *alpestris*, for other land and freshwater shells.—John Radcliffe, 111 Oxford Street, Ashton-under-Lyne, Lancs.

WANTED, British fossils from all formations. Will give in exchange land, freshwater, and marine shells.—Chas. Pannell, jun., East Street, Haslemere.

AMMONITES from Folkestone (gault), Whitby, Lyme Regis (lias), offered in exchange for good fossil echina, any bones or teeth from red crag, &c.; also good rhynconellæ and terebratulæ wanted.—Chas. Wardingley, 30 Blackwood Crescent, Edinburgh.

MICRO-SLIDES, assorted, to exchange for others, or for books or any objects of interest. Approval.—A. Earland, 3 Eton Grove, Lee, S.E.

SCIENCE-GOSSIP for 1885 and 1886, loose, four numbers missing; egg cabinet, stained deal, four drawers, $11\frac{3}{4}$ inches high, $15\frac{3}{4}$ inches long, $11\frac{3}{4}$ inches broad, containing 130 English eggs, also a few unnamed foreign shells, in exchange for curiosities.—G. Waters, 21 Westbourne Park Road, Bayswater, W.

To be disposed of, Rowland Ward & Co.'s naturalist's camera, complete in walnut box, almost new. Address—Rev. J. J. Merry, Rolleston Vicarage, Newark.

WANTED, *P. roseum*, *B. Leachii*, *L. involuta*, *A. lacustris*, *T. haliotidea*, *S. oblonga*, *Z. Draparnaldi*, *H. lamellata*, *H. revelata*, *B. montanus*, *P. ringens*, *A. lineata*, or vertigos. Offered, marine shells. List sent.—James Simpson, 51 Loch Street, Aberdeen, N.B.

BOOKS, ETC., RECEIVED.

"Plant Organization," by R. H. Ward (Boston, U.S.A.: Green & Co.).—"National Health," by B. W. Richardson, M.D., F.R.S. (London: Longmans).—"Pond Life: Algæ and Allied Forms," by T. S. Smithson (London: Swan Sonnenschein & Co.).—"The Colours of Animals, their Meaning and Use," by E. B. Poulton, M.A., etc. (London: Kegan Paul & Co.).—"Mungo Park and the Niger," by J. Thomson (London: George Philip).—"Catalogue of the Flowering Plants, etc., found in Dover and Neighbourhood," by W. T. Haydon.—"Rambles and Reveries of a Naturalist," by Rev. W. Spiers (London: C. H. Kelly).—"The Ether Theory of 1839 is the True Theory of the Leyden Jar," and "Facts which Prove that Faraday's Two-Force Theory of Electricity is False," by James Johnstone (Edinburgh: James Gemmell).—"Land and Freshwater Mollusca of Ingleton, Clapham and District," by W. E. Collinge.—"On the Hymenoptera of Colorado," by W. H. Ashmead (Colorado Biological Association).—"Cloud Nomenclature," by Capt. D. Wilson Barker.—"Entomologist's Monthly Magazine."—"Annals and Magazine of Natural History."—"Le Diatomiste."—"Canary Book."—"British Cage Birds."—"By Sea and Shore."—"The Naturalist's Weather Guide" (Birmingham Naturalist's Publishing Co.).—"The Asclepiad."—"Research."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The American Naturalist."—"The Microscope."—"The Entomologist."—"Book Chat," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: F. R.—A. W. O.—W. C. S.—J. A. W.—W. W.—M. W. G.—J. W. K.—E. A.—T. B. H.—J. W. W.—H. F.—A. D.—W. F. K.—A. J. H. C.—E. P.—G. W. H.—L. M. C.—J. W. B.—F. Le-B. B.—H. F.—W. J. S.—R. S.—T. W. R.—J. B.—W. N. P.—W. J. F.—W. T.—R. G.—C. F. B.—L. R.—H. D.—J. R.—J. E. N.—W. A. G.—E. A.—J. B. R.—J. E. K.—W. E. G.—J. E. L.—R. M. S.—J. S.—P. R. S.—A. J. R. S.—C. W. P.—W. E. C.—H. P. M.—J. J. M.—B. C. R.—J. P. N.—C. W.—C. F. W.—J. C. S.—W. P.—A. W.—H. E.—B. T.—W. D.—J. W. B.—H. W.—P. R. S.—A. E.—G. W.—J. A. F.—F. H. C.—W. A. C.—J. C.—G. M.—D. R.—W. H. T.—H. I.—J. E. V.—A. G. T.—A. S.

BOTANISING IN THE ITALIAN ALPS.

A DAY or two after I had gathered the specimens of *C. ensifolia*, referred to in Science-Gossip for April, p. 92, I made an excursion up the Val d'Esino, in the rocky gorges of the lower end of which *Pteris cretica* is said to occur, though I was unable to find it there. It does, however, grow, and in some abundance, on the banks of a small stream behind Cadenabbia, on the opposite side of the lake; but as I only ascertained this fact the day before I left Lake Como, I had not the good fortune to see that rare fern *in situ*.

There are two paths which run up the valley from Varenna to Esino Inferiore, at which place they unite, and the path runs thence to the top of the mountain ridge which separates Val d'Esino from Val Sassina, so celebrated for the richness of its flora.

Taking advantage of the first fine morning—for we had wretched weather most of the time we were at Varenna—I took the road which leads to the well-known Fiume de Latte, passing, as I left the town of Varenna, a garden in which there are a number of large trees of oleander with stems a foot and more in diameter. I was afterwards informed by an Englishman who lives on the spot that the Oleander hawk moth (*Nerii*) occurs there annually, and that the gardener at a neighbouring villa found as many as eighteen to twenty pupæ in the autumn of 1888. One of these, which failed to produce an imago, is now in my possession.

Soon after getting out of the town there is, on the left, a rather steep and rough path which leads up to the well-known ruin dominating Varenna, and known as the Torre di Vezio. This path, though rough and steep, saves a considerable *détour*, and, besides that, it lies exposed to the sun, and is therefore a better hunting-ground for insects.

On my way up to the ruin I took some very fresh specimens of a pretty and distinct little blue butterfly, which I have never met with elsewhere, and which I have not as yet been able to identify; and several fine examples of a species of that curious family of insects, the Myrmeleonidæ, or ant lions, which look like a cross between a butterfly and a dragon-fly.

These were flying about in a spasmodic kind of way. I mistook the first one I saw for a worn and damaged specimen of *P. machaon*. Several hyales were flying about on the same spot, and, unless my eyes deceived me, one of the ant lions attempted to capture one of these, though it failed to do so. I found, too, on a little grass slope, fine examples of *Ophrys muscifera* and *aranifera*, but I could not find the Fraxinella or *Lilium bulbiferum*, though I had seen both these fine flowers in abundance at a spot only a few hundred yards away a day or two before.

Just near the Torre di Vezio I observed a small patch of lily of the valley, but it is not abundant hereabouts, though it occurs in profusion on Monte Generoso, on the opposite side.

Leaving the ruined tower on the left, I got down as soon as possible to the stream which runs at the bottom of the valley (d'Esino), but there was no sign of cretica, and I therefore again took to the path, which here ran through vineyards and gardens in a sort of zigzag fashion. Here I saw machaon, podalirius, hyale, and semiargus, and obtained two or three fine males of the last, the first that I had ever seen alive.

Just above this spot lies the village of Regolo, and a little further on is Perledo, through the main streets of which the path ascends. Picturesque as these little villages are at a distance, they are not inviting to either eye or nose when more closely inspected.

Soon after leaving the latter place the path bears to the right for some distance, and runs high above the noisy rapid stream below. On the left are rocky precipices, on the right steep grassy slopes inclining at such an angle as to make it unsafe to traverse them without an alpine stock and spiked boots.

On these slopes were quantities of *Gentiana acaulis* and an occasional *Anemone Alpina*. I saw two white flowers of the gentian, one of which I secured. An occasional patch of level ground on the left afforded numerous examples of *Cephalanthera ensifolia*.

Just before reaching Esino Inferiore there are open meadows with fruit trees on both sides of the path, and in these meadows, amongst other things, I found *Trollium Europeum*, *Narcissus poeticus*, and *Orchis tephrosanthos* abundant, the two first especially so. There is an hotel at Esino Inferiore which is much frequented in July and August by people who in those hot months prefer fresh mountain air to the sweltering heat of the plains below, but it was not yet open.

Just beyond this hotel the path diverges right and left, the latter leading into Esino Superiore, the other direct to the path on the ridge.

Taking the former, I reached the upper village in about five minutes, but in passing through left it by a street which I presently found bore away too much to the left.

As it was now about one o'clock, I sat down on a rough grassy bank to eat my luncheon, and was very agreeably surprised to see a quantity of the pretty *Anemone ranunculoides* growing on this bank and in the little pasture just beyond. It was not, however, nearly so fine here as I had seen it a few years ago on the mountains opposite Tremezzo, probably owing to some difference in the soil.

But what gave me greater pleasure than finding the anemone was the sight of three eagles soaring high above the valley. I watched them for several minutes with my field glass, but after soaring round and round in wide and graceful sweeps, they ultimately passed out of sight over the ridge.

I saw these fine birds on two or three subsequent occasions, and there could be no doubt as to their species.

Returning to the village, I hit the right road, and again began to mount, passing through alps and woods as before.

The prevailing trees are walnuts and chestnuts.

The road was now steeper and rougher, and the sun, full on my back, made the climb all the more toilsome; but the quite unexpected find of a plant of the rare *Erythronium dens-canis* made me at once forget the heat and toilsome climb, and I set to work to look for further specimens of the find of the day. After a long search I discovered five or six more plants in flower, and having secured a couple of specimens I passed on, and in about half-an-hour the Cainallo Pass was full in view, but some very wet-looking clouds appeared to be coming up from the valley beyond.

Twenty minutes more brought me to a beautiful alp, which sloped up to the ridge over which the path ran. About half-way up this alp the little stream I had been following up all the morning takes its rise, and just at its source I found a few plants of *Gagea Liottardi* in full flower, and scattered about in the grass around plenty of plants (in flower) of *Crocus vernus*.

Still higher up, and about one hundred yards below the ridge, *Helleborus niger* was growing and flowering in profusion. The flowers varied in colour from snow-white to green and white flushed with crimson purple, and presented a sight such as what the late Mr. Ball called "the poverty-stricken flora" of Europe rarely affords.

By the time I reached the ridge it was past two o'clock, and as I had at least five hours' walk before me, I lost no time in commencing my descent into the Val Sassina, which I could see, two thousand feet below me, stretching away to the right towards Lecco, and to the left towards Bellano.

The side of the range on which I now found myself descends very abruptly to the valley and the precipices immediately to the right, and just under Mount Codeno, which rears its dolomitic peaks four thousand feet above the level of the pass, are surprisingly grand, but to a certain extent softened by the foliage which more or less clothes them and conceals their precipitous and rugged forms.

Unfortunately, I had hardly begun my descent before the threatened rain came on, and in a few minutes it was raining heavily. This and the exceeding steepness and roughness of the path, which descends by numerous zigzags through underwood which meets overhead, made this part of the excursion anything but agreeable. It was not altogether without its compensations, however, for I found and gathered good examples of the curious *Ranunculus thora* and the pretty *Primula calycina*, a species very like *viscosa*—so common on the St. Gotthardt in June—but distinguished therefrom by its calyx and the foliage, which is not dentated as in that species.

About an hour's walk took me to the level of the valley. I was at first surprised, on looking at my aneroid, to see that it still showed an elevation of more than two thousand feet, and I began to think it was playing me false.

However, after a long and, in consequence of the wet, weary tramp over a very rough road, which consisted mostly of ups and downs, but which on the whole gradually descended to the level of the lake, I at length reached Bellano, when, on again referring to the aneroid, I found that from the point where I had entered the valley down to the lake's level there must have been a descent of nearly fifteen hundred feet.

Another hour's walk took me back to my inn. I had no time to botanise on the way, but I saw on the rocks, close to the road, quantities of a phyteuma which I took for hemisphæricum, and numerous spikes in full flower of the pretty *Anthericum ramosum*. *A. capillus veneris* and *A. ruta muraria*, too, were to be seen in two or three places, besides other more common species.

R. B. P.

Eastbourne.

CURIOSITIES IN BIRDS' EGGS.

THE same reason, I have no doubt, which occasioned Mr. Nunn to remark that "it is difficult to stop writing on so interesting a subject," determined me to begin penning these few discursive observations, helping, I hope, to dispel his fear, that, "but few collectors will take the trouble to record the curious facts and irregularities they have met with."

Last April, while poking into odd corners for nature's oddities in West Berks, I found a thrush's nest containing specimens of the spotless spheroid egg, mentioned by Mr. Wright, and as curiosities exhibited them to a company of gossips outside the village inn. To illustrate how easy a matter it is to confound variably marked eggs with distinct species the following will show. One knew they could not be thrush's eggs, for where were the spots? I showed him the nest. Another was sure thrush's eggs were always spotted ever since he was a boy. I presented the nest for his inspection. The village schoolmaster (evidently wise in his day) suggested I was playing a trick, by presenting a *bona-fide* thrush's nest, while I was the bird that deposited the eggs in it. I begged him to say, in that case, what they might be. Starling's likely, though rather blue and round. "Thee bist all very foin to come yer and fool we but 't'en't so aisy I tell'e," was an old codger's verdict. The policeman admitted I probably was quite right, and the company ventilating their opinions, the discussion became heated, the language far, far from parliamentary, and the policeman and my friend the "codger" daggers drawn, with the result that the former threatened to use his prerogative, and "shut up" the latter if he did not put a bridle on his tongue himself, and conduct himself in a more seemly manner. Such is life.

I determined to look out for all future variations, but, unfortunately, found none last year, after the above mentioned. Mr. Wright's notice only aroused my hunting propensity for the abnormal the more, and I am pleased to record a small success already this year.

On April 8th, from a clutch of three thrush's eggs, I took one with the spots thickly congregated at the smaller end. The other two were quite normal.

On the 9th, I found one egg in a thrush's nest which lacked the black spots, and instead had apologies for same, of a whitish watery appearance. Next day the second egg was very similarly marked but spots apparently slightly more distinct. The third day brought an egg with a tendency to approach blackening. The fourth egg had decided black spots (very small) mixed with a few yellowish brown, with a fair sprinkling of the watery ones. On the fifth day no egg was added.

This progression certainly points to a constitutional assertion of the bird's function in the production of the normal, and may be perhaps accounted for by this being the bird's first attempt.

My opinion is that these varieties will be met with more frequently in the early spring, when the variations of the thermometer are greatest, and less so when the temperature is more equable as the weeks advance. I hazard this opinion in spite of the fact that I am aware that many birds, with a tendency to variable markings of eggs, are migrants, and probably lay later, though it must be admitted that even then our summer nights may be winter to them, when compared with the sunny lands they have just left. Again I look upon the variations in some eggs as perfectly normal. Who has ever seen two yellow-hammers' eggs alike in the marking?

I trust, like the first writer to your valuable paper, that many will record their interesting takes, for the good and help of all your readers interested in this subject.

JOHN T. WINKWORTH.

Eddington, Hungerford.

THE STOMATA IN ORTHOTRICHUM.

IN Berkeley's "Handbook of British Mosses" it is stated that stomata occur not uncommonly on the capsules of mosses, but no importance is there attached to them, and it is probable that the attention of the large majority of British moss students, including the writer, will have been for the first time directed to the subject by the publication last year of part twelve of Dr. Braithwaite's valuable monograph, which embraces the genus Orthotrichum. It appears that, as far back as 1866, Professor Lindberg had discovered two forms of stomata on the capsules of this genus, and that in that year he applied them to divide it into two sections, viz. Gymnoporus: "Stomata on wall of capsule superficial"; Calyptoporus: "Stomata immersed in wall of capsule and more or less covered by some of its epidermal cells."

As the subject is of interest, I propose to give a short account.

The stoma, which originates in a single cell in the substance of the cuticle, presents, when fully developed, the appearance, usually, of an oval body consisting of a pair of kidney-shaped cells placed with the concave faces next each other, the space formed in the centre being the pore, or stoma proper. There is a general resemblance between the stomata of all plants however widely separated from each other botanically. In some cases they are longer, and in others nearly circular in outline, and the position of the pair of cells forming the lips, or rim, is generally on a plane, or nearly so, with the surface of the cuticle.

In order to get a good view of the stomata in the capsules of Orthotrichum, the entire fruit (Dr. Braithwaite says "the lower part," but see further) should be cut longitudinally into two or more parts, in order that they may lie flat under the cover-glass, the spores must be washed away, and the spore sac

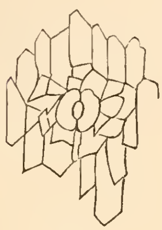


Fig. 94.

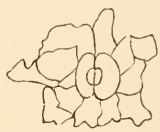


Fig. 95.

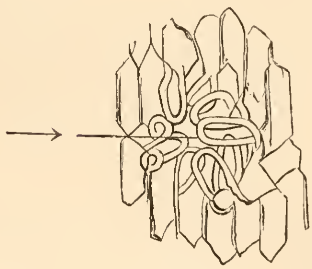


Fig. 96.

removed; but this last is not absolutely necessary, as I was able to find them in specimens already mounted without that precaution having been taken. They occur chiefly on the lower part of the capsule, but are not confined to it. I found some in *O. diaphanum* and *O. affine* as high as, and above the middle, and in *O. rupestre* the highest in one instance was about one-fifth distant from the top.

In those species in which the stomata are superficial, they are surrounded by the cuticular cells either of the normal shape, or by one or more rows of irregularly shaped smaller ones; and these differences occur on an individual capsule, so that they form no guide in the determination of species. The general character of the surrounding cells is the same as of those of the rest of the epidermis. (See Fig. 94, *O. rupestre.*)

The species in which the stomata are "immersed" present rather more difficulty. The stomatic cells are contained in the wall of the capsule and are precisely of the same form and construction as those which in other cases are exposed, but their outline is completely hidden through being covered over by cells of the epidermis. In some cases a considerable proportion of the inner sides of the stomatic cells is left exposed; in others only the central pore is exposed; and sometimes the stoma is completely, apparently hermetically, covered. I found this the case in *O. saxatile.*

The cells which surround or cover the stoma are very distinct from those of the rest of the epidermis; their walls are thicker, smooth, more evenly defined in outline, and semicircular on the sides forming the

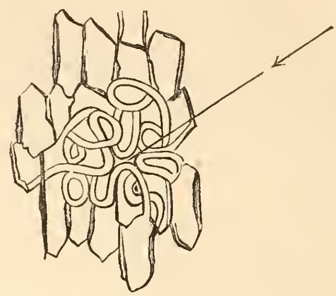


Fig. 97.

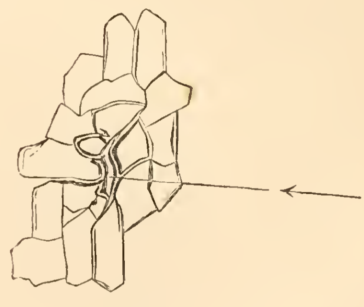


Fig. 98.

orifice, or pit; and where the stoma is completely covered the presence of these cells indicates its position. The outline of the stomatic cells can be dimly seen through the tissue by focussing, or may be found by turning the inner wall of the capsule uppermost.

These thickened cell-walls overlap one another and can only be seen in their entirety by altering the focus.

If the section be examined before the removal of the spore sac, when it retains somewhat of its natural form, the cells covering the stoma appear as dark patches, and by the above means are found to form very slight elevations on the surface of the cuticle. The difference between the two kinds of cell-walls does not necessarily imply an essential difference in structure, as those in the body of the capsule have been compressed laterally in course of development, hence their more or less hexagonal form; but the apparently specialised cells have been more at liberty to follow what may be designated the inherent law of circularity.

In *O. diaphanum* (Fig. 96), and some others, the epidermal orifice is often very large and admits of the entrance and lodgment of one or more stray spores, a circumstance productive of considerable confusion until the eye has become well accustomed to what is being sought for. Further, the orifice varies much in size in the same capsule, and in this respect, again, forms no guide to the species. Dr. Braithwaite

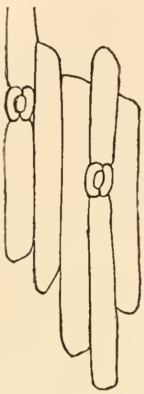


Fig. 99.

Fig. 100.

figures it large in *O. anomalum*, and I find it small in *O. saxatile* (Fig. 97), which (*fide* Braith.) is the same species.

In *O. rivulare* (Fig. 98), the orifice is very small and the differentiation in the adjacent cell-walls is less marked, but whether this is the case in other species with the opening uniformly small I have not at present the opportunity of judging.

Fig. 95 represents a section of the underside of a leaf of the common wild ivy. Fig. 99, the same of the lily of the valley. Fig. 100, of the caper spurge (*Euphorbia lathyris*). The stomata are shown in all three.

W. P. Hamilton.

Shrewsbury.

OYSTERS.

ONE of the greatest difficulties which an author has to face is to find appropriate titles for his books and papers; this may seem to be a matter of trivial importance, and easily overcome, but, *experto crede*, it is often more trying and needs greater cudgelling of the brains than the preparation of the work itself. The title unconsciously influences the current of thought and method of treatment, and when an inappropriate one is chosen, the writer finds himself compelled—for the title is his text—to bear it constantly in mind; and when he has, as he hopes, finished his task, he discovers that it is so little to his liking that he is often forced to begin it anew; and when he again goes over it, he too often finds that he has not done it justice, perhaps even left out much he meant to say: he is then once more compelled to choose a fresh title and again recast his book, and that means immense labour. We have now lying by us an article on which we have expended a world of trouble, and have several times rewritten it, and at our last revision we chose still another name for it, once more having to recast our work. When, therefore, a circular was placed in our hands from which we learnt that a most exhaustive treatise on oysters was coming out, we could only wonder what happy inspiration had guided the industrious author in his fortunate choice of "Oysters and all about them." We positively envied him the comprehensive character of the title; half the battle was won when that name was decided upon; all that relates to oysters, their history, value as food, methods of cultivation, literature—and the subject is one of the vastest known to us—all was in place; and we could not wonder that eight hundred closely printed pages were needed to cover, not the whole of the immense field, but a part of it, for the author, it appears, has been compelled to hold over a great deal of matter which will hereafter see the light, when another and much enlarged edition is called for. The author has given six years of untiring thought and labour to the *opus magnum* of an eventful and dignified life, and he has had, in passing the sheets through the press, the invaluable assistance of a most accomplished and highly cultured clergyman, who has most generously devoted many weary weeks and sleepless nights to the revision of a book which is a perfect treasury of interesting and curious information. The author, Dr. J. R. Philpots, was, we are informed, some time ago sheriff of the district in which he has so long resided, and it has occurred to him that his book, in which he was even then engaged, might be so modified and enlarged that it would do the county of Dorset, but more particularly his own town of Poole, lasting service in drawing attention to the value and importance of oyster cultivation and the facilities for the purpose running to waste in the vast sheet of water known as Poole Harbour. Dr.

Philpots, however, saw that to give his book general interest it would be necessary to adhere closely to his original design, and make the history of the oyster the main feature, so that readers at a distance would not have to complain that it devoted itself to matters of purely local interest.

Before touching on the most interesting parts of the book we are called upon to say that the publishers —John Richardson and Son, of Friar Lane, Leicester, and 6, Great Russell Street, London, W.C.—must be congratulated on the excellence of the paper and the printing and the singular beauty of the binding, and we venture to hope that many other works will follow from the same press. We shall now let the author explain his purpose. "My object," he says, "in preparing the present work has been to furnish the reader and the general public with a clear description of the subject, and to make the medicinal properties and edible value of the common oyster clearer. Another reason for undertaking this work has been the want of a text-book for the student of zoology, which should, at the same time, be a book of reference for the general reader, and this I claim mine to be." The affection—we cannot use any milder term—which Dr. Philpots feels for the oyster has been shared by others before him.

Sallust seems to have had a very high opinion of the oyster, and a very low one of the ancient inhabitants of our country, for he says: "The poor Britons—there is some good in them after all—they produce an oyster." Pliny has given us some valuable information respecting these favourite bivalves, from which it is obvious that the modern method of oyster-culture was followed by the Romans as early as the time of Licinius Crassus, the orator. His remarks are valuable: "The first person who formed artificial oyster-beds (*ostrearum vivaria*), was Sergius Orata, who established them at Baiae, in the time of Licinius Crassus, the orator, just before the Marsic war (circa B.C. 95).

But the oyster had its detractors among the ancients as well as among ourselves. Seneca, who left boundless wealth, after pathetically singing the praises of poverty; Seneca the wise and moderate, who ate several hundred oysters every week, thus launches forth against many good things, and the mud-fattened mollusc amongst them:—"Dii boni, quantum hominem unus venter exercet! Quid? tu illos boletos, voluptarium venenum, nihil occulti operis judicas facere, etiamsi praesentanei non furant? Quid? tu illam æstivam nivem non putas callum jecinoribus obducere? Quid? illa ostrea, inertissimam carnem, cœno saginatam, nihil existimas limosæ gravitatis inferre?" The first sentence has been happily and literally rendered by a learned Dorset rector—"How one belly bothers a fellow." In another letter Seneca says that, "having listened to Attilus declaiming against vice and folly, he for ever renounced oysters and mushrooms, for such things could not properly be called food, and were mere provocatives of the appetite, causing those who were already full to eat the more, no doubt a thing very pleasant to gluttons, who like to stuff themselves with such food as very readily slides down and very readily returns." The last sentence is in allusion to the filthy habit of the Roman epicures in artificially emptying the stomach with the help of emetics.

Whether it was the small size and delicate flavour of British oysters which first brought them into high favour at Rome we cannot tell, though gourmets still assert that our Natives have not their equals anywhere else. Some larger sorts are nevertheless excellent, and the curious reader will find accounts of giants of which one is sufficient for a full meal; we can ourselves recall with much inward satisfaction a visit we once paid to an oyster saloon at Richmond, in Virginia, where we were compelled to feast on a large number of monsters, every one of which would have turned the scale against half a dozen Natives; but in spite of their large size the Americans seemed to us equal to the very best we had tasted elsewhere.

We cannot do better than introduce here a charming passage almost verbatim; from it the reader will be the better able to judge of our author's style.

"In the days when luxury was rampant, and men of great wealth, like Licinius Crassus, the leviathan slave merchant, rose to the highest honours, this dealer in human flesh, in the boasted land of liberty, served the office of consul, with Pompey the Great as his colleague, and on one occasion required 10,000 tables to accommodate all his guests. How many barrels of oysters were eaten at that celebrated dinner the 'Ephemerides'—as Plutarch calls 'The Times' and 'Morning Post' of his day—have omitted to state; but as oysters then took the place that turtle-soup now does at our great City banquets, the imagination may busy itself, if it likes, with the calculation. All we know is, that oysters then fetched very high prices at Rome, as the author of the 'Tabella Cibaria' has not failed to tell us; and then, as now, the high price of any luxury was sure to make a liberal supply necessary, when a man like Crassus, to strengthen his popularity, entertained half the city as his guests. Pliny mentions that, according to the historians of Alexander's expedition, oysters were found in the Indian Sea a foot in diameter, and Sir James E. Tennent unexpectedly corroborated the correctness of this statement, as at Kottiar, near Trincomalee, enormous specimens of edible oysters were brought to the rest house; one shell measured more than eleven inches in length by half as many in width. But this extraordinary measurement is beaten by the oysters of Port Lincoln, in South Australia, which are the largest edible ones in the world. They are as large as a dinner plate, and with much the same shape. They are sometimes more than a foot across the shell, and the oyster fits his habitation so well that he does not leave much margin. It is a new sensation, when a friend at Adelaide asks you to lunch, to have one oyster set before you fried in butter, or eggs and bread-crumbs; but it is a very pleasant experience, for the flavour and delicacy of the Port Lincoln mammoths are proverbial in that land of luxuries."

The need of such a book, if it only accomplishes its purpose, is obvious, for with an ever-increasing demand the supply of oysters is rapidly dwindling away. Prices have been going up for many years, until at last the rich can alone command the attentions of oyster dredgers: for others, such things as Natives are as though they did not exist. And yet how cheap they once were; a single shilling would have bought a larger number than any sane person would have ventured to eat at one sitting, unless he were a Vitellius or a Cæsar. London, Dublin, and Edinburgh all rejoiced in apparently exhaustless supplies, offered at prices so moderate that they painfully disturb the equanimity of the present generation of oyster buyers. Fifty years ago tenpence would, in the Modern Athens, buy a hundred, and now they may some day reach tenpence apiece.

Thirty-five or forty years ago a thousand millions of oysters are said to have been consumed in London alone, and that at threepence a dozen, which seems then to have been the ordinary price, would represent much over a million pounds. In 1864 the metropolis is computed to have got through 700,000,000, the price being then sixpence a dozen, so that the total paid for them reached a million and a half. Mr. Henry Mayhew made, a little later, an elaborate estimate of the number passing through Billingsgate: it was 495,896,000; but in spite of diminishing supplies, the Colne Oyster Company alone still sends up 11,200,000 to the metropolis every year. In the Firth of Forth the supply has dwindled to such an extent that in place of the millions dredged there two generations ago, and the hundreds of thousands of twenty-five years ago, the present total is not 5,000. The reason of this amazing decrease is the stupid recklessness of the dredgers; not only are the scalps—as the natural oyster-beds are called—literally cleared of all tenants fit for the table, but in some cases *every* oyster is removed, and the bed is positively destroyed once and for all. The same thing was happening in France, but the law interfered, and restrictions on the time allowed the dredgers led to a wonderful improvement; indeed we hear that some of the beds are only allowed to be dredged two hours a year, but in that brief time it is said that the little army of practised hands employed will pick 22,000,000 bivalves.

The fecundity of this mollusc is marvellous, as, indeed, is that of all so-called *shell-fish*. Mr. Buckland computed that a crab can reproduce its kind at the rate of over a million a year, and the oyster is not less remarkable. One curious fact is that over twelve million limpets have been gathered on the Berwickshire coast for bait in a single year, without any notable diminution of their numbers. Before the recent careful oyster cultivation of our French neighbours commenced the fate that has overwhelmed our *Natives* seemed likely to befall their French cousins. In 1847 over 70,000,000 were computed to have their home on the single bank of Cancale, but seven years later the number had fallen to 20,000,000, while in 1860 it only reached 10,000,000, and soon after that the oyster colony had wholly disappeared. In 1859 French oyster cultivation began, and matters speedily mended.

The oyster abounds in every sea, tropical and temperate. In America the oyster fisheries are estimated to be worth £2,500,000 a year, the prices there being far lower than with us, and it is computed that 22,000,000 bushels are annually picked. A bushel of Natives represents 1,600 individuals, but the American oysters are so much larger that they only number 300; that would give the American trade as representing 6,600,000,000, while 53,000 men are employed in the fishery, and 4,155 ships. New York is said to eat 900,000,000 oysters a year.

An English oyster has been computed to deposit 1,012,925 ova, but the American giants reach 9,000,000 ova apiece for each full-grown female oyster, so that an abundant supply of spat might easily be kept up.

The only effectual remedy for the dearth of oysters is the imposition of proper restrictions on dredgers. Not only is a close time needed—and some pretence at a close time indeed we have, from the 15th of June to the 4th of August—but only good-sized bivalves should be allowed to be taken. We are now killing off our stock, and before long we may hear of the prices of old Rome being once again asked.

Among the facts hidden away in the curious and little known literature of the oyster, we must mention that Ch'ang Te, who was sent as the envoy of the great Khan Mangu to Hulagu, conqueror of Bagdad, and brother of the said Mangu, has some interesting zoological notes; more particularly one on the pearl oysters of the Persian Gulf, and the method of obtaining them. Were all that has ever been written on oysters collected, a score of volumes as bulky as the one Dr. Philpots has favoured the world with would be needed.

ALFRED J. H. CRESPI.

Wimborne.

THE AMERICAN COCKROACH.

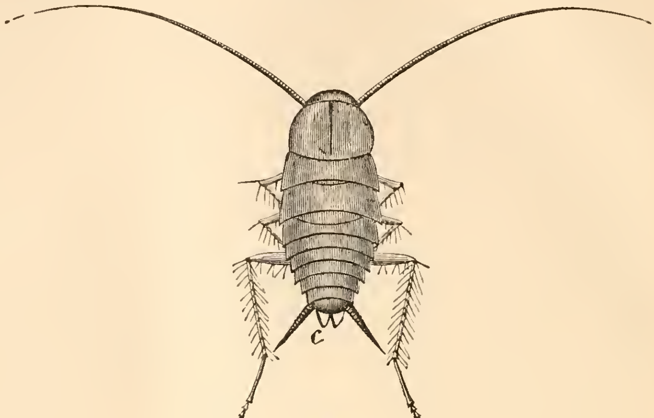
By the REV. HILDERIC FRIEND, F.L.S.

THERE is something both amusing and tantalising in the way in which this handsome insect is treated by our English *authorities* (?). As I take down text-book after text-book, I come across the same cool statements, the gist of which may be gleaned from the following typical extract. After speaking of our common species, which has now become thoroughly acclimatised in England, the writer of this part of Cassell's "Natural History" says (vi. p. 133): "Another species, which has attained a distribution almost as wide, though not so general, is the American cockroach (*Periplaneta* ship, and may be almost constantly met with in the docks, especially when tropical produce is being landed."* This brief, and not very lucid account becomes baffling when compared with that with which Figuier favours us. He says it is from an inch to an inch-and-a-quarter long, that it infests

Fig. 101.

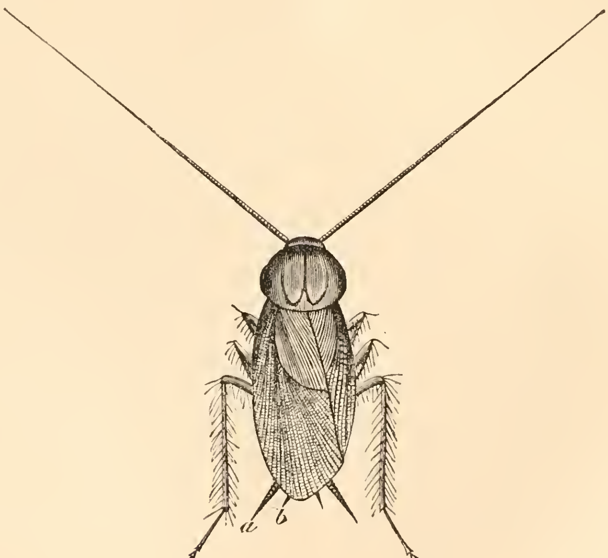
A

Fig. 102.



B

Fig. 103.



C

American Cockroach.—Fig. 101.—A, young or larval stage. Fig. 102.—Full grown, but wingless. Fig. 103. C, perfect insect; *a*, cigar-shaped processes or cerci; *b*, smaller cerci; *c*, podical plates. All natural size, from fresh specimens.

Americana), a native of the warmer parts of America, whence it has been carried in ships to the ports of nearly all parts of the world. It is a larger and redder species than the common cockroach (*P. orientalis*), and the tegmina and wings are fully developed, the former passing beyond the extremity of the abdomen. This insect is common on board ships, running about at night over the sleeping passengers and devouring the food, that it is met with in all parts of the world; and adds that the common cockroach is "a small, hideous animal of a

* See similarly *Circle of the Sciences*, ii. 359; *The Insect World*, by Figuier, p. 287; *Sketches of British Insects*, by Houghton, p. 49; *The Cockroach*, by Miall & Deny, &c.

repulsive smell, and of a reddish-brown colour. It is a little larger than the *Blatta Americana*." How the American species can be at the same time larger and smaller than the common cockroach, and how, if the latter is a small animal it can exceed the former which is upwards of an inch in length, I cannot understand. Such being the delightful lucidity of the subject it seems perhaps preposterous that we should try to mend matters. We can only apologise for our temerity, and say that as the insects have long been known as Lucifugæ, or "light-shunners," the probability is that some of the accounts which have come down to us were written in the dark! This may perhaps account for the many synonyms which the innocent creatures have borne. In the dark ages when Linnæus wrote, they were called Blatta, because Virgil and others centuries before had so named a fœtid insect which shunned the light, and was said to be hostile to bees. But such simple terms are not large enough for your educated modern jaw, which must have the old name relegated to the dark lumber-room where the beasts themselves delight to prowl at night, and the fine term Periplaneta must be invented to take its place. 'Tis true the new designation is Greek and therefore less vulgar, and besides it means "the wanderer"; and as other insects never wander about we must all see the absolute superiority and propriety of the term! Then, lest so elegant a creature should think itself slighted by having only two names, a third has been dug out of chaos by some ingenious being, and our cockroach boasts the name of Kakerlac. To be orthodox for the moment we must call it *Periplaneta Americana*, but in all probability before we have got hold of the right pronunciation we shall find that the creature has been christened afresh.

Now for a few words about the insect itself. I am not writing in the dark, for before me I see specimens dead and specimens alive, specimens in spirits and specimens whose spirits have fled, specimens fasting and specimens feasting, specimens young and specimens old! What more can a man require? To-day I had to pass a conservatory where the creatures abounded; so I looked in, made friends with the head-gardener, and while he caught some "beetles," I bottled a few of the hot-house spiders (*Theridion tepidariorum*) which were so ably described by my friend, Mr. Cambridge, in the July issue of the "Journal of Microscopy."

From the cockroaches here taken I am able to glean the following facts. They still prefer darkness to light, because their deeds are mischievous; for in the early spring they devour bulbs, buds, shoots, and young plants by the hundred. Occasionally an albino turns up, as is the case with the common species. The general character of the creature may be gathered from the following descripton of the Blattidæ as a family:—"This family includes the numerous species of cockroaches or kakerlaks, one of which, under the name of blackbeetle, is but too well-known to most housekeepers. They present a very considerable uniformity of general characters, the body being commonly rather flattened and of an oval form, and the head entirely, or almost entirely concealed beneath the anterior margin of the broad and shield-like prothorax, and so placed that its crown, which rarely bears any ocelli is directed forward. The eyes are large, and more or less kidney-shaped; the antennæ long, tapering, brittle-like, and composed of many joints; the outer lobes of the labium are considerably larger than the inner ones; the coxæ are approximated, the tibiæ spinous, and the tarsi always five-jointed. The tegmina and wings are generally developed, although sometimes abbreviated, especially in the females. When they attain their full development the tegmina overlie one another at their inner margins, and exhibit a strong vein near the outer margins, from which branches are given off on both sides. The wings show the usual fan-like arrangement of veins. The abdomen presents nine or ten dorsal, and from six to eight ventral rings, and at the extremity a pair of jointed cerci" (Cassell's *Natural History*, vi. p. 132). Passing from these general characters to the specific, I find that an average specimen of *P. Americana* measures, from the tip of the antennæ to the extremity of the hind legs exactly four inches. The antennæ are fully two inches in length, the body an inch and a half, the tegmina, or outer wings, one and a quarter, the wings a little less. From the head to the cerci, which extend slightly beyond the closed wings, the length is an inch and a half. The colour of the whole body and appendages is a rich light brown. As a drawing will often help the imagination better than a lengthy description, I have sketched the insects in their different stages to show their characteristic features. As I have no space for further details it must be left to the student to consult the usual text-books for fuller particulars. This can be easily done, since the cockroach has been frequently employed as a type, and has also had an entire volume devoted to its study. In conclusion, I may add that the following recipe will be found very useful for tempting the uncanny creatures to their fate. Take three pounds of oatmeal, or meal of Indian corn, and mix with it a pound of white lead; moisten with treacle so as to form a good paste, and put a portion down at night in the infested building. Repeat for a few nights alternately, and in the morning remove the paste and the corpses to a convenient place.

Carlisle.

No. 38 of "The Book-lover's Leaflet," one of the most interesting monthly-book catalogues, by Messrs. Pickering & Chatto, is to hand. The short paragraphs, &c., attached to many of the titles make this catalogue more than usually interesting.

ON THE COMMON WASP, CHIEFLY AS COMPARED AND CONTRASTED WITH THE HIVE-BEE.

[*Continued from p.* 162.]

WHEN wasps are compared with bees, the comparison is not always to the disadvantage of the wasp.

In nursery rhymes we say—

> "How doth the little busy bee
> Improve each shining hour?"

In point of fact, the wasp is the more industrious of the two; he rises up earlier to work, and later takes rest, as proved by the observations of Sir J. Lubbock.

According to my experience the wasp is better tempered than the bee; she has no preconceived antipathies against particular individuals, as the bee has. I imagine few persons can visit a hive without hearing the shrill note of one or more bees working themselves up into a passion, and the more angry they get the shriller and higher the note becomes.

The wasp is much the more courageous of the two. I remember watching a wasp enter a hive. In a few moments I saw her ignominiously expelled by the united efforts of four or five bees. She was then dashed to the ground, where for a short time she lay panting for breath; then more at ease she began to preen her wings, and when quite recovered she arose with active wing and boldly flew into the hive again.

The wasp exhibits as much ingenuity in making her nest as the bee. All attend to the common welfare assiduously. All show unchanging affection for every member of the community.

The male wasp, in carrying away dirt and dust and in keeping his home clean, proves himself a much more useful member of the community than the drone.

The drone passes the live-long day basking in the sunshine, varied now and then with swift but short flights to show off his resounding pipes, after which he returns with a good appetite for the sweets he has had no hand in collecting. In the case of the bee the union of the sexes takes place during flight, but in wasps the union takes place when seated on boughs or leaves.

The queen bee has internecine battles to the death with such of her rivals as have been spared by the neuters; at length, in despair of success, she leads forth such of her descendants as remain faithful, and remains an exile from her old home for the rest of her days, while the new queen, her daughter, complacently usurps her place and reigns in her stead.

The queen wasp lives in perfect amity and peace with any number of daughter-queens.

The neuter bees at the end of summer ruthlessly put to death their brothers, the drones, as useless cumberers of the ground, and devourers of other people's earnings.

The male wasps share to the last the provisions gathered by their sisters with ungrudging generosity, and are allowed to die a natural death.

Bees far surpass wasps in prudence and foresight; they lay up provisions for rainy days, and thus are enabled to survive the rigours of winter.

Wasps confer no benefit on mankind, with the exception of fertilizing a few of the umbelliferæ, which supply man with aromatic and culinary seeds.

Bees, instead of eating, assist in fertilizing our finest fruit, and the most beautiful flowers of our gardens; and, above all, they furnish us with ample supplies of delicious honey, and of wax adapted for many purposes.

It is no drawback to us that they furnish us with these supplies against their will; it is satisfactory to add that we are now able to compensate them for their losses by giving them syrup of sugar to feed on instead of taking away their lives in order to rob them as of old.

We are now, perhaps, better prepared to estimate the value of the argument between a wasp and a bee, as set forth in the little poem:—

> "A wasp met a bee that was just buzzing by,
> And he said, 'Pretty cousin, can you tell me why
> You are liked by the people better than I?
>
> "'My back shines as bright and as yellow as gold,
> Transparent as gauze my wings I unfold,
> And yet, for all that, I'm not loved, I am told.
>
> "'Your coat is of russet, and dingy and brown;
> I only speak truth—pray do not you frown,
> You still are the joy and the care of the town.
>
> "'I am nimble and brisk, and up with the morn,
> I enter all homes, however forlorn,
> Yet all my advances are treated with scorn.'
>
> "''Tis true,' said the bee, as she rose on the wing,
> 'Men own you are handsome, but then there's one thing
> They cannot put up with, and that is—your sting.'"

This seems to be like the case of the pot blaming the kettle for blackness; at any rate, neither men nor bees appear to be quite impartial judges as to the "whole duty of wasps."

J. YATES.

Newcastle, Staffordshire.

THE COLOURING AND BANDING IN LAND AND FRESHWATER SHELLS.

By JOSEPH W. WILLIAMS.

I OPEN the discussion of the question as to what was the primitive colour of our land and freshwater shells, and what was the form in which the bands arose, with some amount of diffidence, for I have not been so favourably situated for observation in the field as some of my brethren workers have, and have been obliged in some measure to their kindness in forwarding me specimens for examination. I also feel some small amount of compunction because what I have to advance as theory is not the view which has been generally acknowledged by those few who have published their thoughts on this matter. Those few, however, have published an explanation that the evolution of the shell-colour has proceeded along a line leading from the complex to the simple, which seems to me as somewhat contrary to the law of nature, while what I believe nature has been telling us all along is that evolution of all kinds —the shell-colour as well as the mammal from the simple protoplast—has differentiated along a line exactly the polar opposite of that—from the simple to the complex. And I believe it to be as true in the organic world that "ontogeny is a short repetition of phylogeny" as Kepler's law in relation to the motions of the planetary orbs, that "the radius vector of each planet describes equal areas in equal times," or Newton's law of gravitation in the physical world. Upon these two facts of nature, then—that evolution has proceeded along a line leading from the simple to the complex, and that "ontogeny is a short repetition of phylogeny"—I shall build the theory that the primitive colour of our land and freshwater shells was horn-coloured, and that the bands first arose as points which afterwards coalesced; the second of these facts, however, involves the first, and may be stated in other words, that the development of the shell is an epitome of its ancestry. I am also inclined to the belief that the colour to be produced after the horn was white or whitish, and this for reasons which will be presently given; the other colours may, perhaps, have been produced by combinations; but this does not concern my present theory.

The facts which seem to me to support such a theory as the one advanced are as follows:—

1. In the development of the snail, during what is known as the trochosphere-stage, a thickening of the epiblast on the posterior and dorsal side of the larva obtains, termed the shell-gland. This soon invaginates, and a chitinous horn-coloured plug may become developed in it, and especially so, according to Balfour, in abnormal larvæ. This plug, or primary shell, becomes absorbed except in clausilia, arion, amalia, and limax, persisting in the first as the nucleus, and in the last three as the internal shell.

2. During the next stage of development, called by Lankester the veliger-stage, and characterised by the formation of the foot and velum, the shell-gland becomes everted to form a disc-like area which becomes the mantle, and on which the secondary or permanent shell is secreted. This secondary shell is always at first horn-coloured or whitish (generally the first), and always bandless.

3. The majority of freshwater shells are horn-coloured and bandless, and the non-development of colour may be explained on the ground, and legitimately, that environmental conditions are not so great as on land.

4. In these horn-coloured freshwater shells an advance in colour is often seen by the development of white flammules. This I have seen in *L. stagnalis*, *L. peregra*, and *L. auricularia* among our species, and an inspection of the collections in the National Museum will reveal many among foreign specimens. Apart, entirely, from the development of these white flammules, completely albino specimens occur, as *Physa fontinalis*, var. *albina* (Jeff.), *Limnæa peregra*, var. *candida* (Porro), *Limnæa auricularia*, var. *albida* (Jeff.), and *Limnæa palustris*, var. *albida* (Nelson).

5. The nucleus of the secondary shell is always white, whitish, or horn-coloured, and scarcely ever banded.

6. Considering the large degree of environmental conditions on land, some varieties of land shells, backed by their developmental history as concerns colour, may be legitimately regarded as reversions to ancestral conditions. Such would I regard *H. aspersa*, var. *exalbida* (Menke), *H. nemoralis*, var. *albescens* (Moq.), *H. hortensis*, var. *albina* (Moq.), *H. hortensis*, var. *arenicola* (Macgill), *H. hortensis*, var. *pallida* (Ckl.), *H. arbustorum*, var. *albinos* (Moq.), *H. cantiana*, var. *albida* (Taylor), *H. rufescens*, var. *alba* (Moq.), *H. concinna*, var. *albida* (Jeff.), *H. granulata*, vars. *cornea* and *albida*, *H. pisana*, var. *alba* (Shuttl.), *H. virgata*, var. *pelluscens* (Shuttl.), var. *albicans* (Gratel), *H. caperata*, var. *alba* (Pic.), *H. ericetorum*, var. *alba* (Charp.), var. *cornea* (Loc.), var. *vitrea* (D. & M.), *H. rotundata*, var. *alba* (Moq.), *H. lapicida*, var. *albina* (Menke), *H. acuta*, var. *alba* (Req.), *B. montanus*, var. *albina* (Moq.), *B. obscurus*, var. *albinos* (Moq.), *P. umbilicata*, var. *albina* (Moq.), and so on.

7. That *Cyclostoma elegans*, being a pneumochlamyd, is an example of a freshwater form which has adapted itself to live on land, and possesses the following suggestive varieties, viz., var. *albescens* (des Mouls), var. *ochroleuca* (des Mouls), and var. *pallida* (Moq.).

8. That even noting the large degree of environmental conditions on land, yet many are horn-coloured in their typical condition, as instance the hyalinæ, and the amphibious succineæ. That the commonest colour-variation in these is white, as instance *S. elegans*, var. *albida* (Taylor), *H. cellaria*, var. *albinos* (Moq.), *H. nitidula*, var. *helmii* (Alder), *H. pura*, var. *margaritacea* (Jeff.), *H. nitida*, var. *albinos* (Moq.), etc.

9. That considering progression has been from the simple to the complex, is *prima facie* evidence that bands first were points which afterwards coalesced even if there were no other evidence forthcoming. But what may be legitimately considered as "reversions" occur, as *H. aspersa*, var. *flammea* (Pic.), *H. nemoralis*, var. *interrupta* (Moq.), *H. hortensis*, vars. *interrupta* and *punctella*, *H. virgata*, var. *tessellata* (Bouch.), and so on.

10. That even considering the fact that horny and white coloured varieties of our land specimens occur,

yet the reason that they are not so common as the freshwater forms of those colours is that, owing to the larger amount of environmental conditions, they are farther removed from their primitive condition and would not be expected to readily revert.

11. That the explanation of the horn-colour persisting in our hyalinæ is to be sought, in great measure, to their smallness, and, consequently, their relative immunity from destruction by those foes which make snails their food.

The above statements massed together under their several numbers have each and all a bearing direct on the theory I have advanced when seen in the light of the fundamental law of Haeckel, and the hypothesis of evolution, as enunciated and given by Darwin, Spencer, Romanes, Sutton, and others. Many conchologists have doubtless specimens in their collections which will still further elucidate these several points, and, perhaps, add others. The strongest support no doubt is that given under the first four numbers, and with some these facts would by themselves warrant support to the theory. But only as a theory, and as a tenative for further work, it must at present stand.

57 *Corinne Road, Tufnell Park, N.*

NOTES ON VEGETABLE TERATOLOGY.

AS I thought, the flowing summer has been useful in drawing the attention of hosts of our readers, not only to the normal, but the abnormal growths of plants. The number of specimens sent me has been legion. One would have thought this must have been the most phenomenal year in the history of vegetable growths, judging by the number sent. Instead of that being the case, it is perhaps the mildest the editor ever remembers. Increased observers and increased observation discover a larger number of monstrous forms, just as an increase in the numbers of our police is the means (or ought to be) of discovering, not more crime, but more criminals.

Of the almost overwhelming number of teratological curiosities sent, I would draw chief attention to those of rib-wort plantain (*Plantago lanceolata*). I never remember a more wonderful or comical variety of inflorescence it has run into than that of this year. *P. lanceolata* has simply been "on the Spree" (but not in Prussia). At first I thought of illustrating the most interesting of its abnormal growths; but, as they came trooping into the office from all parts, I had at last to remember the cost of illustration.

Just note, in connection with the rib-wort plantain the fact that it represents a retrograde—not an ambitiously advanced—form of flower and inflorescence.

Fasciation (or "clubbing") is often due to disease. The disease may be caused by greedy aphides, or less greedy cynips (note the terminals growth of the twigs of the lime trees in gardens, and the galls which have suppressed further growth of the branches.)

I often wonder how far insect parasitism, or vegetable parasitism, by attacking the growing and developing parts of flowering plants, has helped to modify the shapes,[1] seasonal habits, and general characters every flowering plant has acquired. The colour and shape we know it by is, because of all its preceding ancestral conditions. What were they? Will the study of vegetable monstrosities help us? I think they will.

Fig. 104.—Fasciated shoot of Gorse.

Fig. 105.—Fasciated shoot of Gorse.

The Rev. F. H. Arnold's sketch of the fasciated stem of gorse is exceedingly interesting as noting how the shapes of plants may be due to external influences shaping them. Also a sketch of curious malformations of cabbage leaves, suggesting the origin of pitcher plants.

Mr. Thomas Baker (Ipswich) sent me a good specimen of an old cabbage rose, in which what ought to have been the pistil was developed into an almost perfect flower-bud.

J. W. Horn forwarded a few most suggestive specimens of the common garden marigold, all of which were in the condition known in the field daisy as "hen-and-chickens." As I have already pointed out, the hen-and-chickens monstrosity is practically the normal condition of the cud weeds (Gnaphalium), one species of which was described by an old botanist

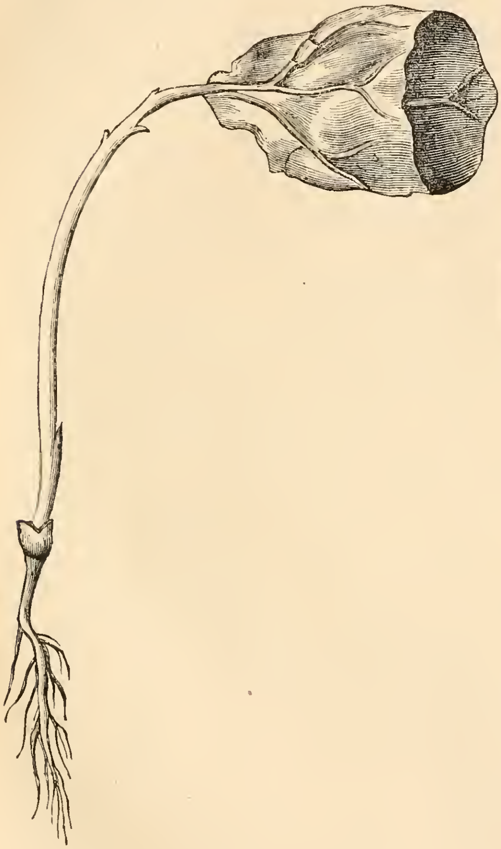


Fig. 106.—Abnormal form of Cabbage Leaf.

as *herba impia*, because the young shoots shot up above the elders!

Next Mr. H. L. Stonham, F.L.S. (being of course interested in this most interesting subject), sends the following: "A few weeks ago I took a specimen of *Paris quadrifolia* (herb Paris) with six well-developed leaves, the venation being very distinct. As its specific name implies, this plant normally possesses four leaves. One of the four sepals had also become converted into a perfect leaf, in every respect as well marked as the true ones. The other parts of the plant were perfectly normal, both as regards numbers and shapes, the connectives being somewhat unusually prolonged. Another plant had sprung up along the rhizome, having four leaves; but devoid of an inflorescence."

Mr. Horace Pearce, F.G.S., writes from Stourbridge (and sent some very interesting teratological specimens of *Veronica spicata* (?) fasciated). It would be advisable to note whether introduced plants are more liable to monstrosity than native, or old cultivated kinds.

Mr. P. Jack, of Coatbridge, Lanarkshire, forwarded two of the most suggestive specimens I have seen—a couple of double-headed dandelions. We are accustomed to their double and even treble-headed first cousins the hawkweeds. Did the dandelions travel to the dandelion stage by that route?

I have long held an almost affectionate intercourse with the ardent "working man botanists" of my native Lancashire. I know their pluck, their independence, and their tempers! No class of men in the English world of science are more thoroughly scientific, as Mr. Leo Grindon will testify! So, I hear from John Fletcher, of Westhoughton, Bolton, as follows: "As you invite readers of your paper to note and record any departures from normal types of plant structures, I have taken the liberty of trying to describe a specimen of long-rooted cat's-ear (*Hypochœris radicata*) found in Westhoughton on June 30th. The peduncle was an inch and a half across, was flattened, and was divided about half way up into two halves. Below and above this division there were many pedicels branching off, each having one flower-head, but the two principal pedicels had each three flower-heads. I also got a specimen of dandelion (*Taraxacum dens-leonis*) with a double scape and two flower-heads; also a specimen of adder's tongue with two fertile fronds."

J. E. Taylor.

SOME EAST SUSSEX PLANTS OBSERVED FROM 1884 TO 1890.

THE following are the names, and as often as possible the localities, of a few East Sussex plants observed during the last six years, generally with dates of observation; in the case of two or three species I have to acknowledge the help of another observer. The nomenclature followed is that of "Arnold's Flora of Sussex."

Glaucium Luteum, Scop. (Yellow Horned Poppy). Beachy Head, Eastbourne, August 5th, 1889.

Malva Moschata, L. (Musk Mallow). (1.) On banks of the South Eastern Railway near Ticehurst Road Station, September 16th, 1885. (2.) Roadside between Mayfield and Tidebrook, August 30th, 1887. (3.) Near the High Rocks between Tunbridge Wells and Groombridge, on the Langton side of the Brighton and South-Coast Railway. This was just on the boundary line of the two counties.* "Woods and banks rather common, especially near the chalk" (Arnold). The localities in which I have found this plant have always been clay soil.

Ulex Europæus, L. (Common Furze). The furze was very early this year in flowering; in full bloom near the sea-shore, Cliff End, Winchelsea, April 7th, 1890.

Ulex Nanus, Forst. (Dwarf Furze). Frequently on Ashdown and Broadwater Forests.

Ononis Arvensis, L. (Rest Harrow). Eastbourne, on cliffs, August 5th, 1889.

Rubus Idæus (Wild Raspberry). Ashdown Forest, between Gill's Lap and Crowborough. (A. W. Clarke.)

Apium Graveolens, L. (Wild Celery). Winchelsea, on the south side of the town near the New Gate, in great abundance, and in flower, April 6th, 1890. Mr. Arnold speaks of it as by no means common in this part of Sussex.

Daucus Carota, L. (Wild Carrot). Near Eastbourne, on cliffs, August 5th, 1889.

Scabiosa Arvensis, L. (Field Scabious). Beachy Head, August 5th, 1889.

Centaurea Scabiosa, L. (Greater Knapweed). Eastbourne, near Beachy Head, August 5th, 1889.

C. Cyanus. Same locality and date as above.

Campanula Rotundifolia, L. (Hare-bell). Frequently in heathy localities such as Ashdown and Broadwater Forests.

Vaccinium Myrtillus, L. (Whortleberry). (1.) Frant Forest. (2.) Ashdown Forest. (3.) Near Wadhurst (A. W. Clarke).

Erica Tetralix, L. (Cross-leaved Heath). The usual habitat of this plant is said to be on the low and boggy parts of moors, but on Ashdown Forest I have found it growing not only in the bottoms, but on higher parts, for example, near the summit of Gill's Lap, and here the ground was not marshy.

E. Cinerea, L. (Fine-leaved Heath). Ashdown and Broadwater Forests, Brightling Woods, woods near Bayham Abbey, on banks of lanes, especially where the soil is sandy.

Vinca Minor (Lesser Periwinkle). Near Eridge Green; roadside, April 6th, 1885. This is just one of those plants the localities of which ought not to be too accurately made known to the public in general in districts like the south-east of England, where it is not any too abundant, for the delicacy and beauty of its foliage and flowers make it, as well as its doubtfully native ally, *V. Major*, a general garden favourite; hence it is likely to fall a frequent victim to plant collectors and vendors, and so become, at the least, exceedingly rare.

Gentiana Pneumonanthe, L. (Marsh Gentian). Ashdown Forest, September 15th, 1884; Ashdown Forest (A. W. Clarke). It is to be hoped that all local naturalists will do their best to prevent this rare and beautiful plant from becoming extinct.

Echium Vulgare, L. (Viper's Bugloss). Eastbourne, August 5th, 1889.

Linaria Vulgaris, L. (Yellow Toad-flax). Have found it commonly in heathy localities.

Primula Vulgaris, Huds. (Primrose). In localities such as the neighbourhood of Wadhurst, near Eridge Green, in woods about Harrison's Rocks, near Groombridge, about Winchelsea, Pett, and Icklesham, and in numerous other places with which I am unacquainted, the primrose still grows in wonderful luxuriance. In the immediate neighbourhood of Tunbridge Wells it is certainly becoming rare. We may trust that the protests that have lately appeared in various journals, natural history and otherwise, against the wholesale uprooting of the plants as Primrose Day approaches, will have some effect in the direction of the protection and consequent preservation of a flower bereft of which the spring season would be indeed a blank.

Lysimachia Vulgaris, L. Banks of East Rother, Witheringden, near Burwash, August 8th, 1889.

Arum Maculatum, L. (Cuckoo-pint). Seen in flower near Winchelsea this year as early as April 6th.

Ruscus Aculeatus (Butcher's Broom). Roadside near Pett, on the way to Cliff End, in flower and in fair abundance, April 7th, 1890.

Scilla Nutans, Sm. (Wild Hyacinth, Blue-Bell). In flower near Winchelsea, April 6th, 1890.

Narthecium Ossifragum, Huds. (Lancashire Bog Asphodel). Ashdown Forest, August 6th, 1888. Two of my specimens from this locality measure 10 inches in length, with leaves $\frac{1}{12}$ inch wide, but I have received a plant labelled "Hills above Bettws-y-coed, N. Wales, August 19th, 1888," the length of which is $4\frac{3}{4}$ inches and leaves about $\frac{1}{8}$ inch wide at the middle.

Scolopendrium Vulgare, Sm. (Hart's Tongue Fern). "Woods, walls, hedge-banks, common," (Arnold). On the banks of a lane at Winchelsea, January 1st, 1886, in fair quantity. I have never found it anywhere in the neighbourhood of Tunbridge Wells, and am inclined to believe that it is far from common in that district. Not only this, but every other species of fern that is a favourite in gardens will become rare, or even extinct, in the neighbourhood of towns and villages unless landowners lend their aid by rigidly protecting those growing on enclosed grounds, such as woods and parks, against the ravages of itinerant collectors and vendors. I was told some years ago that in the Wadhurst district, owing to the ruthless way in which they had been uprooted, ferns had become far less numerous than formerly.

ARCHIBALD L. CLARKE.

6 *Courthope Rd., Mansfield Rd., Gospel Oak, N.W*

* Under the recent Local Government Act alterations were made in the boundary line between Sussex and Kent in the Tunbridge Wells district. The details of these I have not ascertained, so perhaps this record may be permitted to stand for Sussex, though to the best of my belief the flower was found on the north, or what was the Kent, side of the stream.

ANOTHER AFTERNOON OF CONCHOLOGICAL WORK IN NORTH STAFFORDSHIRE, WITH SOME BOTANICAL NOTES.

SO many of my conchological friends have kindly expressed to me the interest they derived from reading a short article which appeared in the February number of SCIENCE-GOSSIP on this subject, that I am tempted to send a few notes on a second little expedition in search of land-shells. It was on Saturday the 8th February last, a fine, bright, sunny afternoon, that I and my friend Mr. T. F. Burrows, sallied forth again, with the intention of paying another visit to our old *Helix fusca* ground; but on arriving about three miles on our way I suggested that we should vary our route by turning up a bye-path through a favourite rocky dell, and perhaps one of the prettiest bits of scenery in the valley of the Churnet, in order to gather a few flowers of that rare plant *Petasites albus*, which I knew grew in this charming dell. Accordingly, we took the turn, and soon came across the flowers, beautiful in their white masses, on the banks of the little meandering stream, and also peeping out of the nooks and crannies of the rocks, where, doubtless, the seeds had been washed in flood-time. This plant was, I believe, noticed first in this locality about a year ago, by my botanical friend, Mr. E. D. Bostock, who at once pronounced it to be *P. albus*, and a good find we knew it to be, as Sowerby, in the latest edition of his "English Botany," states that this plant is only found wild in a few places in Yorkshire and Scotland. This year the first flowers were found in January, and specimens were sent to several of our leading botanists at Kew and elsewhere, to make sure of its identity, as the leaves, which afford the simplest means of distinction, had not yet appeared. Doctors are sometimes said to disagree, I believe, and so in this case there was at first a considerable difference of opinion as to whether our specimens were the true *P. albus*. Now, however, all the authorities consulted have come to one harmonious conclusion, and agree that my friend who first discovered the plant on this spot was quite right in pronouncing it to be *P. albus*. Such a wild flower as this, flowering as it does alone and almost in the depth of winter, braving the frosts and snow without any apparent injury, and enlivening the general wintry outlook, is one to be valued indeed. We shall do our utmost to protect it from those so-called botanists who seem to take a delight in clearing away many of our rarer wild plants and ferns, and in attempting, as Mr. Shirley Hibberd said of some vandal tourists in the Lake District a few years ago, if possible, "to peel the planet." In this same spot to which I have referred, it may be interesting to botanists to hear that we find the handsome heart-leaved valerian (*Valeriana Pyrenaica*), sweet Cicely, (*Myrrhis odorata*), and several of the orchids; and not far off we meet with the moonwort (*Botrychium lunaria*), *Lathræa squamaria*, and many other botanical treasures which it always cheers a botanist to find flourishing in their native haunts. Having gathered two or three spikes of *P. albus* for botanical friends, we proceeded on our walk up this delightful dale, and having mourned over the giant of the valley, a splendid specimen of the larch, now laid prostrate, alas! by the woodman's axe, our conversation naturally turned to conchology; and on my reminding my companion that we were on the spot where the only Staffordshire specimens of *Helix lamellata* of which we had ever heard were found, he replied that he was quite tired of searching for this shell in this locality; and as a fact both he and I and others had spent many hours, not to say whole afternoons, in this fruitless search. "That is just the sort of spot, amongst those beech leaves, to find Lamellata," I remarked; whereupon my friend seized a handful of the leaves, and, curiously enough, one of the very molluscs appeared to our view! We could scarcely at first believe our eyes, but there sure enough it was; and on careful examination no doubt remained that we had at last found our long-searched-for *H. lamellata*. It is a northern shell, and Rimmer gives Yorkshire, Scotland, and North Wales as the localities where it has been found; and now we may add North Staffordshire to the list, and I think this will probably be found to be its southern limit. This find brings our North Staffordshire list of species of land and freshwater Mollusca up to ninety-six: not a bad number, I think, for only half an English county. On further search we were only able to find three more specimens, and evening drawing on, we reluctantly had to leave, and I need scarcely say we never reached our *H. fusca* ground at all that day. Besides *H. lamellata* we found many Zonites, and a few other common Molluscs; but in how much of interest to a naturalist, and especially to a microscopist, does such a long search amongst the fallen and decaying leaves result! The specimens of minute larvæ, beetles, spiders, and insects of all kinds that one comes across are almost innumerable. Amongst these perhaps the most interesting which we came across were the Chelifers, belonging to the genus Arachnidæ and the family called Pseudo-scorpions. These creatures have oval bodies, and the palpi are elongated, and strongly resemble the claws of the true scorpion; in fact, they are just like small scorpions without tails, and furnish most interesting objects for the microscope under a low power.

But I am afraid I have already been tempted to gossip too long, and I must conclude by saying, that although the results of this little natural history ramble were not altogether so fruitful as those of our last, yet perhaps to us they were more valuable, as we had at last discovered (or rather rediscovered) *H. lamellata*, for Garner in his "Natural History of Staffordshire" had already mentioned this shell as having been found in our county; and this species will, I believe, be one of the last, if not the last, of our land and freshwater Mollusca which we shall be able to add to our list. At the same time, from recent experience I shall not be surprised at anything which turns up unexpectedly in natural history in any locality.

JOHN R. B. MASEFIELD.

Rosehill, Cheadle, Staffordshire.

COCOA AND ITS ADULTERATION.

UNTIL lately perhaps there was hardly any article of food which was so often adulterated as cocoa, and for this there were excuses. The poor liked their cocoa thick, while the large amount of oil, which naturally exists in this vegetable product, compelled the makers to add enormous quantities of starch, sago, arrowroot and sugar, partly to satisfy the vulgar demand, but still more to increase solubility. To such lengths was adulteration carried that it was actually found by Dr. Hassall that eight only in fifty-four samples examined by him were pure, while in a batch of sixty-three specimens thirty-nine contained appreciable quantities of colouring matters, brick-dust (though this is said to be a mistake) and peroxide of iron being among them; and Dr. Edmund Parkes, whose lightest word commanded respectful attention, rather comically remarked that some of the so-called homœopathic cocoas were rightly named, for the amount of cocoa they contained was so small. Whatever might be said about starch and sugar, no defence of alkaline additions can any longer be attempted. True, they give an appearance of fictitious strength, much as carbonate of soda seems to increase that of tea. But now that—thanks to recent improvements—the whole of the cocoa butter or oil can be easily expressed, and indeed is expressed by the best makers from their finest brands, the addition of potash, soda, and other foreign chemical substances is unjustifiable. It is not often that scientific men agree on any point, but there is wonderful unanimity among them as to the importance of food and drink being as pure as possible: that is, the makers should religiously avoid all medications, flavours, and additions, which make them other than they are naturally. Why should cocoa, the wholesomest, best and most nutritious of all the beverages prepared for ordinary use be spoilt, for we cannot use any milder term, by the addition of foreign matters? Chocolate is confessedly a manufactured article, and, therefore, when only compounded with sugar and pure flavouring ingredients is not to be condemned. Our remarks apply wholly to cocoas used as beverages, not to chocolate.

In spite of the liking for thick drinks, the adulteration of cocoa has greatly told on its consumption by retarding the rate of increase. We are informed that eighteen million pounds, more or less, are now manufactured in England; why should not five times that quantity be annually used? The cocoa essences by our best firms are conspicuous for their absolute purity in all respects, and their freedom from all additions of sugar, starch, colouring matters and alkalies; the last, indeed, are not wholly free from danger and serious objection, for it is found that even minute quantities, when taken regularly for a long time, do marked injury: the appetite suffers, the bodily and intellectual vigour is impaired, and the general tone is lowered; in short, the healthy system is decidedly better without them. The real friends of cocoa are those who, remembering what to the sanitary reformer are elementary truths, do their best to impress the lay public with the importance of always using pure, unadulterated preparations.

S. U. M.

THE FOOD OF THE BIRDS.

By REV. H. A. MACPHERSON, M.A., M.B.O.V., ETC.

MR. PARKINSON'S observations on the food of birds are so much to the point, that I should like to endorse their general purport heartily. As the present paper is entirely called forth by Mr. Parkinson's article, I propose to follow his statements consecutively.

I. The nightingale subsists almost wholly, if not entirely, on insects. The lesser whitethroat, blackcap, and some other warblers are fond of fruit; but not, I think, the nightingale. It is extremely fond of the larvæ of the common wasp.

II. The titmice feed principally on insects, but the crested and coal tits are partial to fir seeds. The seeds of the common Sunflower are eaten greedily by the great tit. The marsh tit (in common with the goldfinch and linnet) is partial to the seeds of the thistle family. I have seen longtailed titmice feeding on "looper" caterpillars, and Dr. Girtauner contributed to Dresser's "Birds of Europe" a charming account of birds of this species, which he fed in confinement on plant-lice.

III. Greenfinches feed on the seeds of many so-called weeds. On the other hand, I have seen them gathering turnip seed almost as fast as it was sown, such numbers being present as to be undoubtedly injurious to the interest of the farmer.

IV. Thrushes are also deadly enemies of garden snails.

V. All the warblers will take insects. I once found a male blackcap full of ladybirds. The thorough way in which this species will clear the elder bushes of their berries in autumn is diverting. Near Montreux, I have seen long rows of the bushes thus treated.

VI. The redbacked shrike certainly kills young birds, but it also kills field mice. It subsists chiefly on Coleoptera, bumble bees, and other insects, which are usually deftly impaled on convenient thorns. In Mr. Pidsley's forthcoming "Birds of Devonshire," I have recorded how on one occasion I observed a whole family of this species glutting their appetites on caterpillars (of a Vanessa) which were bolted whole.

VII. The hawfinch is undoubtedly injurious to green peas. On the other hand it consumes many caterpillars. In 1887, Mr. Bartlett, the Curator of the Maidstone Museum and a well-known naturalist, dissected several hawfinches, killed in May and June. All of these poor birds contained green caterpillars. In one case, a female bird proved to have swallowed no less than forty of these larvæ.

VIII. The bullfinch consumes the seeds of dock, plantain, and other undesirable weeds. Its presence is a benefit to us during all but the spring months, when it should be scared from orchards.

IX. Nuthatches certainly take nuts, and beechmast also. But they subsist on insects all the summer. A female in my possession used to take bluebottle flies from my fingers with avidity. Woodpeckers are far more than merely "innocuous." They are the forester's best friends; their wanton destruction is one reason why many plantations are destroyed by boring beetles.

X. Wagtails and pipits are chiefly insectivorous, but buntings are so in a very limited degree. I admit that both the snow bunting and Lapland bunting will eat insects in summer, and the common bunting is partial to beetles. But the latter species does some harm to ricks, when too numerous. Yellow buntings are fond of blackberries. Cirl buntings cannot thrive long without insects.

XI. That the sparrow should be exterminated ruthlessly everywhere I quite admit. I should like to see a Sparrow Club in every parish in England, and to hear that a vigorous crusade was sustained. But it is fond of insects. It is very fond of house flies, frequently kills the White Cabbage butterfly, and I saw one ambitious bird make repeated swoops at a fine swallowtail (Machaon).

XII. The starling is most useful, but it interferes sadly with woodpeckers, and should be kept within reasonable limits. At present it is increasing so fast that in a few years it must become sadly injurious I fear.

XIII. The rook has increased so disproportionately of late as to become a great nuisance. I think a tax should be placed on Rookeries. The quantity of corn that this species destroys is out of all proportion to the value of its services in killing grubs; its numbers being in many districts legionary, it has become as injurious to game preservers as the Carrion Crow.

XIV. The pied flycatcher feeds largely on caterpillars. Some young birds which I sent to the South Kensington Museum, contained small beetles and tiny caterpillars. If space permitted, I could testify to the value of the spotted flycatcher, which feeds on the yellow underwings and other moths.

XV. Chaffinches sometimes pull up young radishes. They consume large quantities of insects. I once saw an old female bring an enormous earthworm to one of her nestlings.

XVI. Of the Corvidæ, the raven is a bit of a poacher, and injurious to the sheep farmer, but it is a useful scavenger. The hooded and carrion crows are sad rascals, but they swallow mice and other vermin. The jay steals eggs, but it lives largely on snails, and I have found its stomach crammed with large beetles.

XVII. Owls are certainly the farmer's friends, and pole traps are largely to blame for the plague of rats, which we hear so much of now-a-days. Kestrils consume many mice. I have not space to speak of the other Falconidæ, but *en passant* the merlin swallows earthworms, and the persecuted peregrine sometimes lunches on such an unimportant trifle as a skylark, as I pointed out recently in the "Field."

XVIII. XIX. These require no comment, except that Mr. Gurney has found that the nightjar sometimes swallows vegetable substances (as does the cuckoo).

XX. Crossbills do not live exclusively on the seeds of Conifers, as Mr. C. Parkinson seems to suggest. They feed on insects also. Both the late Dr. Saxby and myself have recorded our observations of crossbills feeding on aphides; other evidence of a similar kind is forthcoming.

XXI. Wood-pigeons are at once injurious and beneficial. They require to be kept within moderate limits, and then they do good.

XXII. The corncrake subsists on slugs, and insects of various kinds; a useful bird.

XXIII. The siskin "cannot do much damage." I should like to know any damage done that can be laid to the share of this charming finch? It feeds, like the goldfinch, on insects, as well as on grass and other seeds.

XXIV. Any one, who will take the pains to observe a pair of whinchats, will find that they feed their young on caterpillars almost exclusively.

XXV. The wryneck consumes ants principally. The wheatear fattens on the small beetles and other insects that are to be found about loose stones.

XXVI. The goldcrest will take small seeds, but prefers insects. A caged bird of mine used to devour the larvæ of clothes moths with a relish.

It is hardly necessary to comment further. I have followed Mr. Parkinson's paper, as he suggests, point for point, and though I have done so in the most casual and chit-chat way, his remarks have been so well selected, that it was hardly necessary for me to do more than corroborate his evidence.

I cannot agree with him that the rook should be tolerated; for I consider that the present increase of this bird is very alarming indeed. I speak advisedly, and on mature consideration. I think that starlings and wood-pigeons are also becoming so numerous, especially the former, as to upset the balance of nature. Therefore they should be killed off, where too abundant, at the beginning of the breeding season. The same remark applies to the lesser black-backed gull, a most destructive bird. But I think, also, that a wise toleration might be extended to hawks and owls. In regard to our smaller birds, I think that we should protect all, except a scheduled few, together with their eggs, during every month in the year.

SCIENCE-GOSSIP.

Messrs. Geo. Philip & Son send us one of their ingenious little sun-dials adjustable for all latitudes, which they make and sell at the price of three shillings. The cube in which it is packed for transmission, and on which it stands when ready for use, also affords a complete exponent of the decimal system of measurement and weight. It is a capital little instrument for use in schools, &c.

The reprints of Professor Prestwich's papers, "On the Relation of the Westleton Beds of Suffolk with those of Norfolk," and "On the Relation of the Westleton Shingle to other Pre-glacial Drift in the Thames Basin," are before us. These papers, as might be expected, are very comprehensive, and are fully illustrated with diagrams and maps.

We have received "A Theory of the Sun's Radiation of Heat," by W. Goff (London: Ed. Stanford); "Authenticated List of the Birds of Herefordshire," compiled by G. Horne; "Are Hawks and Owls injurious to Game?" (A well-written protest against the terrible and mistaken cruelty committed on our moors and plantations in the interests of game preservation), by W. J. Clarke. The two latter are published by the Naturalist's Publishing Company.

Nos. 3 of Mr. Wallace's books, "British Cage-Birds," and "The Canary Book," reach us from Mr. Upcot Gill, and are in every way admirable.

"The Transactions for 1889 of the Nottingham Naturalists' Society," contains the following papers:—"Farther Evidences of Glacial Action in Snowdonia," by E. Kidson; "The Spectroscope: Its Uses," by Rev. G. R. Hodges; "The Geology of Nottingham, Where and How to See It," by J. Shipman (a rattling good paper); besides summaries of other papers. That of the "Guernsey Society of Natural Science," contains the following:—President's Address, Mr. T. Guille; "On the Genus Isoetes," by E. D. Marquand; "The Flora of Herm," by the same; "The History of Herm," by Rev. J. R. Lee; "Crustacea," by J. Sinel; "A List of the Macro-Lepidoptera inhabiting the Islands of Guernsey, Alderney, Sark, and Herm, with Notices of their Occurrence," by W. A. Luff, and reports of excursion.

"The Report of the Felstead School Natural History Society for the Year ending Christmas 1889" is very creditable, and one of the best reports of school societies that we have seen. The papers on "A Visit to the Broads," by R. L. Barber; "Some Poisonous Plants," by Rev. E. Jepp; "Pond Life," by N. A. Crosby, are particularly interesting.

This year the long excursion of the Geological Association will be to the Mendip Hills. The Rev. H. H. Winwood, M.A., and Mr. Horace B. Woodward will be directors; and Professor J. H. Blake, Professor C. Lloyd Morgan and Mr. J. McMurtrie will probably explain the geology of some of the localities.

There are several philosophical societies but no club, and so a philosophy club is founded as a centre for philosophical thought, and also as a general social meeting place for members of the several learned societies. The chief aim of the club is to encourage original thought founded on a sound moral basis. Its address is 26 Suffolk Street, Pall Mall.

Mr. C. B. Plowright, of King's Lynn, has had the distinguished honour conferred upon him of being appointed a Professor of Comparative Anatomy and Physiology at the Royal College of Surgeons for the ensuing year. We understand that he will deliver a course of lectures at the college in April next on "Diseases of plants produced by fungi."

MICROSCOPY.

New method of preparing Lantern Slides.—From your notice in last month's paper, it would seem that Dr. Sorby's way of making lantern slides from real objects, as contrasted with drawing, etc., is a novelty. In acknowledging the service he has done in introducing the subject, let me say that not only animals can be treated as he names, but vegetables too. Take for instance: *Nitophyllum laceratum*, *Dasya coccenia*, *Ceramium acanthorum*, *Euthora cristata* amongst the larger algæ. Several species of Adiantum, Lygodium, Cheilanthes, Nephrolepis amongst the ferns, are very beautiful when deprived of the chlorophyll. Mosses, too, of the larger kinds are very good. The leaf fungi are excellent, because they show at a glance the eccentric way in which the fructification develops. The same remark will apply to many of the flowering plants. Their venation and structure are very beautifully and truthfully shown in this way for lantern slides. I have tried several phanerogamic as well as cryptogamic plants for a long time past, and find them all that can be desired. —*John E. Vize, Forden Vicarage, Welshpool.*

HANDY BLOCK FOR WORK-TABLE.—Mr. W. J. Simmons's sketch of a "Handy Block for the Work-Table" has induced me to send you a sketch of one I have used for a long time, and found to answer well for dissecting purposes. It is easily made, very portable, and could be manufactured out of an old cigar box; and from the sketch will need very little

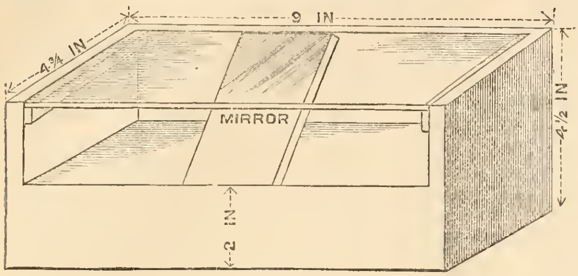


Fig. 107.

explanation. It is made of pine about ⅜ of an inch in thickness, with a small drawer at the back to hold all necessary dissecting instruments, brushes, watch-glasses, knives, &c. A piece of glass is fitted in the top on which the watch-glass or glass trough is placed for working purposes. For a lens I use one on a brass stand, such as is used for botanical purposes. For a mirror I have a piece of an old looking-glass, cut to size, and put in a slanting position so as to reflect the rays of the lamp up through the watch-glass.—*J. Boggust.*

ZOOLOGY.

SNOW BUNTING IN WORCESTERSHIRE.—All doubt as to the ownership of the eggs was settled by my nearly catching the bird on the nest, as she was sitting at the time. I am well aware of its rarity, but knew at once the prize I had secured.—*D. W. B.*

CATERPILLARS AND CHANGE OF FOOD.—Two or three years ago, I got from a dealer about a dozen caterpillars of *C. elpenor* (the elephant hawk-moth), which had been fed on vine leaves. As it was more convenient to get the food natural to the caterpillar in this country (the common willow herb), I tried them with that plant, but they absolutely refused to touch it, and at some inconvenience I had to procure them vine leaves which they at once greedily ate. I was very much puzzled at the time to account for this refusal of larvæ to eat their natural food, but I think I have lately obtained a clue to the mystery, for Professor Weismann, in his "Studies in the Theory of Descent," states that there are three other species of this genus (Achemon, Crêtica and Capensis) found as far apart as N. America, India, and the Cape, all of which are vine feeders. This looks as if the common ancestor of all the species must have fed on the vine, and that when Elpenor or its predecessors reached this country it was compelled either to adopt another food plant or suffer extinction. It is of course very surprising that my caterpillars should have instinctively preferred what was probably the natural food of the genus to that food which the species must have fed on for such vast periods of time, but after all it is not more surprising than the appearance at the present day, in some animals, of limbs and muscles that have been functionless for equally long periods.—*R. B. P., Eastbourne.*

APHIDES ON ROSE TREES.—This season the rose-bushes in south-western Essex are dreadfully infested with the green aphis and the small leaf-rolling caterpillars which have almost totally destroyed what would have been otherwise a plentiful show of roses. At the same time the wild roses in the hedge-rows and in Epping Forest are quite clear. Is this immunity of the wild species a general fact, and if so, what is the reason?—*J. W. Slater.*

BUTTERFLIES' EGGS, &c.—It may be interesting to some of those who read the article under the above title, on page 115 of the present vol. of SCIENCE-GOSSIP, to know that temperature is not the only cause of variation in the colour of butterflies. M. Nicolas Wagner, by a series of experiments displayed before the Academy of Sciences, about the year 1865, showed that electricity also produced this effect. His experiments were performed on *Vanessa urtica.* He found that electric currents changed reds into orange, and blacks into reds, and with a constant battery, a weak current produced spots varying in shape with the strength of the current. He further demonstrated that the colours naturally existing in the butterfly's wings were due to currents in that organ, the most powerful of which passes from the attachment of the wing outwards along the middle nervure to the outer edge. In these experiments he used a Bois-Raymond galvanometer of 20,000 coils. The following are the conclusions he arrived at. 1. The existence of fixed electric currents in the wings of insects. 2. The possibility by means of electric currents to provoke a change in the shade and disposition of the colouring matter. 3. And the possibility, by means of these currents, to produce a kind of atrophy and to change the shape of the wings. He concludes as follows: "with these facts as basis, I propose to pursue my research on this subject."—*R. J. S. Wood, Q.C.C.*

THE SAND GROUSE STILL IN SUFFOLK.—I am pleased to inform you on reliable authority that the sand grouse have been recently seen in this locality. Alfred Alexander, a fisherman of Thorpe, near Aldborough, a person well acquainted with these birds (as he is also with sea birds especially), observed about the 15th May last, when off in his boat a short distance from the shore, a flock of fourteen; they were flying in a southerly direction. He also informed me that a pair had been seen at "Scott's Hall" farm, about the same date. As many persons have the impression that these interesting birds have left this country, I think it would be well to publish these facts in SCIENCE-GOSSIP.—*Edward Neave, West End, Leiston, Suffolk.*

ANTHOCHARIS CARDAMINES.—This pretty butterfly, although reputed "common everywhere," is in some seasons scarcely seen at all, but it has been very abundant during the present spring and summer. Can any one however explain how it is that the males apparently so greatly outnumber the females? Are the latter more sluggish in their movements and fly about less, or how is it they are so seldom seen. They may sometimes of course be mistaken for common whites such as Rapæ or Napi but this cannot always be the case with practised entomologists.—*Albert H. Waters.*

SHELLS FROM ROXBURGHSHIRE.—Mr. J. Roseburgh has kindly sent me a batch of shells which he lately collected at Galashiels. The batch includes *Helix nemoralis* var. *libellula* 12345 and 123(45), *Vitrina pellucida*, *Cochlicopa lubrica*, *Hyalina cellaria*, *Helix hortensis* var. *lutea* 12345, *Helix rotundata*, *H. hispida*, *H. granulata* (=*sericea*, partim), *H. arbustorum*, *Bulimus obscurus*, *Pupa umbilicata*, and *Clausilia rugosa*. The last eight of these species are, I believe, recorded for the first time from this shire.—*J. Williams, 57 Corinne Road, Tufnell Park, N. W.*

BOTANY.

A NEW BRITISH PLANT.—Sir,—In your paragraph in the May issue of SCIENCE-GOSSIP, referring to Mr. Bailey's paper "On *Arenaria Gothica* as a Plant new to Britain," there occurs an error to which I wish to draw your attention. In it you assert that the specimens were found by Mr. Bailey at Ribblehead, Yorkshire. Mr. Bailey lays no claim to having either found or discovered it, as he owns therein that the plant was first discovered there by a Skipton botanist—viz. myself, and that the specimens he has were given to him by Mr. J. G. Baker, F.L.S., of Kew Herbarium, who visited the locality in September of last year and gathered them from directions supplied to him by me.—*Lister Rotheray, 48 Otley Street, Skipton.*

GAGEA LUTEA.—In my note last month on this plant, for Sitton (Dorset) read *Silton* (Dorset).—*Rev. Charles F. W. T. Williams, Zeals, Bath.*

THE FLORA OF GUERNSEY.—On E. D. Marquand's article on the "Flora of Guernsey" I should like to note that the cowslip (*Primula veris*) only grows in one, not generally known, spot in Jersey, and that the primrose is apparently rapidly vanishing before the potato—and the tourist. I recollect *Asparagus officinalis* on the sandy sea-shores, and marvelled why its culture was not more general in the island, most of that which is sold being imported from France. *Anthyllis vulneraria* I have found in Jersey (two localities), but have noted the absence of *Mercurialis perennis*, *Erica tetralix*, *Caltha palustris*, and *Anemone nemorosa*. Roses, with the exception of the little sand roses, are rare; honeysuckle extremely abundant both in Jersey and Sark; the stems are used to make fishermen's baskets, being peeled, and very closely woven. If the rage for greenhouses is exterminating the Guernsey rarities, the rage for the potato is having an equally sad effect in Jersey; I am glad to hear there is talk in the island of a return to the once famous orchards.—*M. E. Pope.*

GEOLOGY, &c.

NEW MAMMALS FROM THE RED AND NORWICH CRAGS.—A paper on this subject was recently read before the Geological Society by Mr. E. T. Newton, F.G.S. This paper contains descriptions of mammalian remains from the English Pliocene belonging to eight species, nearly all being new to the Crags, and four of them new to science. A remarkable low-crowned, but broad, lower carnassial tooth from the Norwich Crag of Bramerton is referred to the genus Lutra, and named specifically *L. Reevei*. All the other specimens noticed below are from the nodules bed at the base of the Suffolk Red Crag, and the first four of them are in the possession of Mr. E. C. Moor, of Great Bealings. A right ramus of a lutrine lower jaw, differing from the common otter in having the hinder fangs of the premolars much larger than the front ones, and agreeing in this particular with the *Lutra dubia* of De Blainville, is referred to the latter species. A humerus of a seal, most nearly resembling that of *Phoca vitulina*, but of smaller size and more slender proportions, is called *Phoca Moori*. Another seal's humerus, having a peculiarly triangular shaft, is thought to belong to the *Phocanella minor* of Van Beneden. A maxilla with three teeth, evidently belonging to the genus Trogontherium, but of smaller size than the *Trogontherium Cuvieri*, is believed to represent another species, and is named *T. minor*. The ziphioid rostrum in the Ipswich Museum, which received from the Rev. H. Canham the MS. name of *Mesoplodon Floweri*, is for the first time described; and another rostrum in the Museum of Practical Geology, characterised by being very short and with a deep boat-like anterior extremity, is named *Mesoplodon scaphoides*. The peculiar species *Ailurus anglicus*, hitherto known only by a piece of a lower jaw with a carnassial tooth, is now further illustrated by a fine upper molar recently presented to the Museum of Practical Geology.

RHÆTIC FOSSILS.—The finding of anything beyond the merest fragments of any of the larger reptiles along the Rhætic-Lias section near Watchet, Som., should be of some little public interest, and I chronicle, therefore, the occurrence of the remains of a large Ichthyosaurus in the Lower Lias between Lilstock and Stolford, about eight miles to the east of Watchet. The remains consisted of about fifteen slightly disarranged vertebræ with ribs attached, all the rest of the animal was wanting, having probably been separated by sea currents during decomposition. At various places on the coast I found detached vertebræ, all of Ichthyosaurus, and at one place, between Watchet and Blue Anchor, I found a few washed out of the shell by the action of the sea, loose amongst the pebbles. In talking with an inhabitant of some geological attainments, I was told of one or more entire or nearly entire specimens having been discovered close to Watchet; a thing not of course unlikely, seeing that the general horizon is apparently that of Street, near Glastonbury, where they are abundant; but I have not been able to verify or disprove this hearsay evidence; perhaps some of your readers may be able to supply additional information. Between Watchet and Blue Anchor I came upon fragments of the well-known Rhætic bone bed; but apparently harder and more flaggy than at Aust Cliff, Gloucester, the equivalent horizon. On some slabs about to be built into a wall, I noticed a pretty good specimen of the pretty shark spine, *Nemacanthus monilifer*. Close to this horizon, Professor Dawkins found many years ago the earliest Mammalian teeth in Britain.—*T. Stock.*

NOTES AND QUERIES.

FOLK-LORE.—A few days ago, when a friend of mine was returning home with a fine live specimen of the grass-snake suspended from his walking stick, a benevolent carter, whom he met, asked if he knew what he had got. On my friend replying that he did, the man added, "That's a deaf adder" (a name usually applied in this part of the country to *Anguis fragilis*); "if he bites you you'll be dead before sundown. If you cut him open you will find written on his flesh:—

"If I could hear as well as I see,
No man nor beast could pass by me."

This speech was *bona-fide*, and my friend, after some useless efforts to convince the man of its utter absurdity, proceeded on his way laughing.—*R. McKenzie Skinner.*

BLUE-TIT'S NEST IN A BUFFER OF A RAILWAY TRUCK.—On May 22nd, while a truck was standing in a brewery yard, one of the men noticed some hay in the buffer (which is a hollow iron one, with a 1¾ inch hole in the centre). On examination it proved to be a blue-tit's nest with three eggs (one broken). The truck had come the previous day from Whittington, Salop, and had been recently repaired. Probably the nest was built during the time it was standing for repairs. There were also nests started in the other three buffers. I need hardly say the bird was not a passenger in her nest.—*Jno. E. Nowers, Burton-on-Trent.*

ALOPECURUS PRATENSIS.—The other day I found a specimen of the meadow fox-tail grass (*Alopecurus pratensis*), with a fasciated stem and double head.—*P. Tracy, Ipswich.*

COLOUR OF BIRDS' EGGS.—I have a small collection of magpies' eggs which might also be interesting. No. 1, pair bluish-green with grey spots in the usual way; No. 2, one egg pure white, no spots; No. 3, one egg very pale blue, nearly white, with a few olive-green spots; No 4, one egg dirty white with a few purple spots, and one large purple blotch; No. 5, one very dark (rather darker than a skylark's), and nearly round and rather small. All the eggs are the usual size and shape, except the last-mentioned; but I find that this variation is not confined to birds' eggs alone, for I have quite a list of birds themselves that I have seen out of the usual colour.—*Henry Blaby, Brackley, North Hants.*

WHITE ROCKCIST.—I should very much like, through your valuable columns, to draw attention to the fact that Babbacombe is not the only habitat in this neighbourhood for the white rockcist (*Helianthemum polifolium*). I have seen it on Walls Hill, Babbacombe, but have also found it on Daddy Hole plain, Torquay; and on the 4th of May this year, having walked out from Brixham to Berry Head on a botanizing expedition, I there found it blossoming luxuriantly all over the south side of the old enclosure of the headland—divided by five and a half miles of water from the other two habitats.—*H. MacC. White, Torquay.*

HOW DEEP DO HYBERNATING MOLLUSCA BURY?—I have done a lot of collecting during the winters of 1886-89 in the Airedale district about Calverley, Apperley Bridge, and Eshold, and my experience is as follows:—December 7th, 1886. New line, Calverley; *Helix nemoralis*, mouth upwards, level with the surface of the soil, under withered grass; and in tufts of coarse grass, with thick ephigram formed. In all my visits to this locality in winter I find the same thing, also with *H. virgata*, but this very often comes out on bright days.—January 1st, 1887. On side the towing-path, canal bank, Idle and Thackley; *Helix arbustorum*, amongst the dead fronds and roots of ferns, also a few *H. nemoralis* and *hortensis*. Nemoralis in holes in the wall; hortensis and rufescens amongst recently fallen leaves of briar and thorn; *Zonites glaber* under stones and timber (one stone was a large one, about two cwt., such as is used for building the locks), it was four to six inches down in the ground; under this we found two *Limax maximus*, five *Arion Bourguignati*, one a subfuscus, four *Z. glaber*, two *Z. alliarius*, and two *H. rufescens*—these were in the runs of some burrowing animal.—January 5th, 1887. Buck Wood, Thackley; *Z. alliarius*, var. *viridula*, under stones, along with the type and *Z. purus*; none of the Zonites, except nitidus and excavatus, can be fairly said to hybernate; at least, this is my own experience. I have never found any others with an ephigram formed. The winter months are far the best time to collect Zonites, I think, as the vegetation is low, and the stones are better to get at.—November, 1889. Bramley Hall Wood, in company with Mr. Hartley. *Zonites excavatus* common, buried six or eight inches in the leaf mould; *Z. glaber*, and a specimen of a greenish white variety, *Z. alliarius* and *H. rotundata*, var. *alba*, under stones.—March 15th, 1890. Pool bank, accompanied by Mr. Hartley. *Zonites glaber*, very fine, under stones and bark, very lively; two fulvus amongst moss, also *V. pellucida*, *H. rotundata*, and var. *alba* under stones; *H. rufescens* on the wall and tree trunks; *H. nemoralis* hybernating amongst the grass. A var. of *Anadonta cygnia*, which occurs at Pudsey in a disused mill reservoir, is, in winter, from eight to twelve inches down in the mud, and in summer only two to four inches, but always buried.—*F. Rhodes*, *Eccleshill.*

Fight between a Starling and a Cat.—Reading Mr. Waters's note on the pugnacity of the greenfinch, brings to my remembrance a scene I witnessed about a week ago between a starling and a cat. The starling had been feeding, and the cat interfered. Instead, however, of the starling flying off, it boldly faced the intruder, flying and pecking at it, and judging from the fact that the cat was glad to slink away, the starling had the best of it. During the progress of the battle, three sparrows appeared on the scene, and gave what aid they could in annoying the common enemy. Two other starlings, seemingly companions of the fighting one, watched the whole performance from a safe distance.—*Mr. C. Shields.*

Disease of Hawthorn Tree.—Probably some of your readers will be able to suggest a cause for the mysterious dying away of a large may-tree in a garden which adjoins mine. It was a red may and it has long been one of the pleasures of spring-time to look on its masses of deep pink blossom, but now, alas, the silence of death is in the tree; last year it leafed and blossomed with its usual vigour, and in the autumn was sprinkled all over with haws, giving many a feast to the birds; when it shed its leaves, rather late in the year, in November, if I remember rightly, there appeared to be nothing the matter with it, but this spring, whilst all the trees around are putting forth their fresh young foliage, the may-tree presents nothing but a tangled mass of dead brown branches. On the night of the 3rd of September in last year a very violent thunderstorm raged around us for about twelve hours, working great damage in some parts, and I have thought that it may have blighted the tree to such an extent that, although the damage was not immediately apparent, yet it had such an effect upon it as to cause it to gradually die away during the winter. So far as I can see there are no evidences of damage, but the tree at the present time presents its usual winter aspect.—*J. Herbert Allchin*, *Sutton Valence*, *Kent.*

Birth-place of the Electrical Telegraph.—With regard to the paper on "The Birth-place of the Electric Telegraph" in last month's Science-Gossip, in 1747 Bishop Watson sent the discharge of a Leyden jar through 10,600 feet of wire suspended on poles on Shooter's hill, and a plan for an Alphabetical telegraph to be worked by electricity appeared in Scots Magazine for 1753, which, however, seems never to have been realized. At Geneva, in 1774, a telegraph line was erected by Lesage, consisting of twenty-four pithball electroscopes, each representing a letter.—*M. Farrant.*

Cry of Corn-Crake.—I was always under the impression that the cry of the corn-crake foretold fine weather. On Sunday evening their cry was especially noticeable, but on the following day there was a perfect deluge of rain. When riding about the country in the evening I have frequently heard their cry, but it was always when there was a spell of fine weather and never when there was rain about.—*F. C. F.*, *New Malden.*

Dytiscus marginalis.—These beetles are not particular as to the quality of the water, but in order to keep it pure for one's own comfort, it is necessary to keep a moderate amount of growing water-weeds in the tank, and never to leave any of the uneaten food to decompose in the water. A fresh-water mussel might be a useful addition, and the Paludina is as tough a univalve as one can find for the purpose of cleansing the glass sides from any confervoid growth. With these precautions it will be found quite unnecessary to change the water at all.—*W. G. Kemp.*

The Recent Mild Winter.—Mr. Wm. Wilson's observations on plants during the mild winter of 1889-90 in the July number of Science-Gossip, causes me to supplement his interesting details. In this neighbourhood many greenhouse plants braved the winter, viz., geraniums, cytisus, acacia, prickly aloe, "diplacus," shrubby mimulus, *Solanum capsicastrum*, etc. Many of the wild plants which Mr. Wilson specifies I remarked in flower. The oldest inhabitant never remembers such a winter, if we may so call it? The bloom on flowering shrubs such as hawthorn, broom furze, wild roses, woodbine, etc., should be noted, and the early flowering of our wild plants.—*Rev. S. A. Brenan*, *Cushendun*, *co. Antrim.*

The Food of Birds.—While agreeing with a great deal advanced by Mr. C. Parkinson in his article on the food of birds, on page 149, I must really protest against his wholesale condemnation of that familiar denizen of the house-top and garden, the common sparrow (*P. domesticus*). That the sparrow is a mischievous pilferer at certain seasons of the year I am well aware, but when engaged in rearing his numerous broods during spring and early summer, I unhesitatingly affirm that *Passer domesticus* in his raids on the insect-pests of the garden, field, and orchard, is then one of the firmest friends the husbandman has. Any one wishing to verify this statement can easily do so by watching the birds' constant visits to the nests laden with beakfuls of larvæ and grubs. In the autumn the sparrows are a great pest among the sheaves of corn, and should then be judiciously thinned, but we hope the time is very far distant when Mr. Parkinson's advice to "destroy them all" is acted upon. Mr. Parkinson speaks of the tree sparrow (*P. montanus*) as being a useful bird. In what way, may I venture to inquire, does this species differ as to usefulness from its more familiar congener? He also says that he has "never been able to discover any harm done in the garden or orchard by chaffinches." Though loth to say a word without due reason against any of our "feathered friends," more especially against such a bright little bird as the "bachelor finch," yet when I see him strutting and pecking about the seed-beds in the garden in early spring, I generally give him a gentle hint to make himself scarce. This weakness for radish, lettuce, cabbage, kail and other garden seeds, renders the gay little chaffinch anything but a welcome spring-visitor to our gardens. At other seasons, as far as I know, his visits are harmless enough.—*W. H. Warner, Fyfield, Abingdon.*

SEASONAL NOTES.—May 11, swifts seen; May 13, white clover in flower, *Geum rivale* in flower; May 16, ash in leaf; May 18, holly in flower, mountain ash, horse-chestnut and oak, *Anthyllis vulneraria;* May 19, butterwort and *Veronica beccabunga* in flower; May 23, ox-eye daisy in flower; May 26, foxglove in flower; May 28, yellow iris and *Orchis maculata* in flower. June 3, ash-leaved potatoes dug in open ground; June 7, woodbine and *Rosa spinosissima* in flower; June 9, dog-rose in flower and elder; June 10, butterfly orchis and *Gymnadenia conopsea* in flower; June 13, rubus and guelder-rose; June 14, *Lathyrus pratensis* in flower; June 16, horse-fly seen; June 17, *Œnanthe crocata* and ragweed in flower; June 22, young wasps on figwort flowers; June 23, sea convolvulus and jasione in flower; June 25, wild carrot, yellow bedstraw and yarrow in flower; June 28, rest-harrow and *Plantago major* in flower; June 30, *Erica cinerea* in flower.—*Rev. S. A. Brenan, Cushendun, co. Antrim.*

DYTISCUS MARGINALIS.—Very likely the meat your correspondent, Mr. Kirkald, feeds his beetles on is the cause of the "milky, turbid water," if undevoured particles are allowed to remain in the vessel. I should recommend that they be fed, instead, with small worms, flies, or other insects, which constitute their natural food, and would not be likely to taint the water. I have often kept water snails of the commoner kinds, as Planorbis, Limnæa, Paludina, etc., with specimens of *D. marginalis*, and have never found them to fall victims to their insect fellow-prisoners; but dispositions vary, even in the lowest orders, and so it is with our friend the "great water beetle." I should imagine operculated molluscs would be the least likely to be eaten up, as they are naturally better protected from enemies by their possessing a "door" to their shells. I have noticed leeches endeavouring to fasten on the operculum of a closed Paludina, and found them unable to do so from the concavity of that organ. As to allowing the water to become putrid, I should advise Mr. Kirkald, unless the vessel in which he kept his pets is of sufficient dimensions, not to allow any impurity to remain. I have found them live very well in clear water. They should always have a little weed or shingle to cling to, as their specific gravity is lighter than that of water. I have a glass case measuring about ten inches by six inches, in which, for some time, I have been keeping various denizens of the water, and I have not touched its contents, except for the occasional introduction of food, or fresh stock, for nearly a year, and all the decaying matter it contains, while giving rise to numerous microscopic beings, has not in the least affected the transparency of the water, though, no doubt, it would do so if the case was shaken up. I think, therefore, that so long as the aquarium is of tolerable size, and is supplied with sufficient mollusca, etc., to check the too rapid increase of conferva, there would be no need for Mr. Kirkald to trouble about changing the water.—*F. P. Perks.*

AQUARIA.—I should be pleased to correspond with one or two gentlemen, interested in natural history in general, and the aquaria in particular, with a view to promoting Saturday afternoon excursions to the suburban districts for the observation and collecting of natural history objects.—*F. P. Perks.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

F. T. (Oldham).—Your beetles belong to the family Dermestidæ; generic name, Tiresias; specific name, Serra; both insects are alike. This insect is not very common, occasionally taken beneath the bark of willows, &c., but there is no accounting.

J. W. D. M.—"Half-Hours in the Green Lanes" is published by Messrs. W. H. Allen & Co. at 2*s.* 6*d.* The bifurcated variety of the hart's-tongue fern is very common.

W. H. WARNER.—Address, Mr. W. Harcourt Bath, Ladywood, Birmingham, *re* British dragon-flies.

C. CARUS WILSON.—Address Offices of the U.S. Geological Survey, Washington.

PEBBLE-RIDGE.—You will find a full description of the singular bicoloured inflorescence of laburnum in the earlier vols. of SCIENCE-GOSSIP.

D. W. BARKER.—Thanks for the excellent photos of *Campanularia* and *Plumularia*, to which reference will be made in next SCIENCE-GOSSIP.

MOTTET.—We hope to print your excellent paper on the South of France in our next issue.

H. P. FREDERICK.—We are much obliged for the specimens of *Plantago lanceolata*, which has run riot this summer.

W. D. R.—Newman's "Butterflies and Moths," have excellent uncoloured illustrations of each species. Kirby's work includes coloured illustrations of the insects in different stages, and food plants. It came out a few years ago in 7*d.* parts and was published (we believe) by Messrs. Cassell. Mr. W. Wesley, 28 Essex Street, Strand, and Mr. W. P. Collins, 157 Great Portland Street, have frequently good second-hand copies for sale.

M. CROWLEY.—The editor was much pleased with the monstrosity of cauliflower leaf. A similar specimen is engraved in "The Sagacity and Morality of Plants," where also a suggestion is made as to the probable relation between it and pitcher-plants.

W. H. TYNDALL.—Dr. McCook's work on "American Spiders and their Spinning Webs," is published at about a guinea. Apply to Messrs. W. Wesley & Sons, 28 Essex Street, Strand.

H. DURRANT.—See Taylor's "Aquarium" (London: W. H. Allen) for illustration of self-acting fountain. You will also therein find instructions for mixing ingredients for artificial sea water.

F. T. W.—The wheat plants sent us are attacked at their bases by the larvæ of a wire-worm beetle, probably *Agrotis lineata.*

DR. M.—Will inform you in our next. It is very singular.

EXCHANGES.

OOLITIC and liassic fossils offered in exchange for those of the same or other horizons.—T. Stock, 16 Glen Park, Eastville, Bristol.

OFFERED, *Planorbis lineatus, Helix hortensis, H. arbustorum, H. cantiana, H. ericitorum, Pupa secale, Cyclostoma elegans.* Wanted, *Bythinia Leachii, Helix pomatia, H. concinna, H. fusca,* &c.—Frederick Harding, Shipley House, York Road, Eastbourne.

OFFERED, land, freshwater and marine shells. Wanted, foreign correspondents, especially in S. Africa and S. America.—A. Whitworth, 65 Talbot Street, Southport, Lancashire.

WILL one or two gentlemen join the writer in a geological trip to the Isle of Wight, during the last fortnight in August.—Particulars: G. E. East, junr., 10 Basinghall Street, London, E.C.

ILFRACOMBE.—H. W. will be much obliged with the name of any working naturalist or boatman conversant with marine zoology of this coast.—93 Bethune Road, Stamford Hill, N.

WANTED offers for an ⅛ water immersion objective. Powell & Lealand's new formula.—Jenkinson, 79 Surrey Street, Sheffield.

Ross & Co's No. 1 binocular microscope on the Jackson model, complete with all modern improvements. Objectives by Powell & Lealand. Cost £200. Will exchange for wine of noted brands.—H. I., 17 Store Street, W.C.

Rare mosses, *Bauxbaumia Aphylla, Catiscopium Nigritium, Grimmia Donniana, Bryum Warneum, Hedwigia Ciliata, Hypnum, Crista Castrensis* (barren) and many others. Wanted, Gardner's "Flora of Forfarshire," or "Twenty Lessons on Mosses," (Gardner).—D. Robb, 280 Hilltown, Dundee, N.B.

OFFERS wanted for "Popular Science Review," 1877–78, in one vol. Owen's "Palæontology," Mantell's "Wonders of Geology," 2 vols.; "Medals of Creation," 2 vols.; "Richardson's Geology," "Phillips' Treatise on Geology," 2 vols.—J. A. Floyd, 5 Hospital Road, Bury St. Edmund's.

OFFERED, intrusive dolerite with coal embedded in matrix; also prehnite and analcrine. Wanted, micro-slides of rocks or minerals, or specimens of same.—John Connor, Eldon Place, Elderslie, near Johnstone, N.B.

THE medical and pharmaceutical students' collection of specimens, 120 packets all named. Will exchange for store boxes, setting-boards, natural history books, or what offers.—William L. Balmbra, Warkworth, Northumberland.

WANTED "The Zoologist," unbound for 1878, 1879 and 1880, also the Nos. for January and February 1881. Must be in good condition, state price.—Charles Oldham, Ashton-on-Mersey.

WANTED, any quantity of used English postage-stamps (ones now in use) send particulars of quantity also price per thousand to "Stampus," 24 Sidney Grove, Newcastle-on-Tyne. Also will exchange rare duplicate foreign stamps with moderate collectors, send lists.

WANTED for exchange, fossils from all formations, must be good specimens.—T., 56 Clarendon Villas, West Brighton.

OFFERED, oolitic and other fossils, with a few worked flint flakes, for literature on the oolite and lias.—J. A. H., 38 Oak Road, Scarborough.

To foreign collectors. British land, fresh-water and marine shells in first-class condition, offered in exchange for those of any other country. Please send list of duplicates to Fred. W. Wotton, Adamsdown, Cardiff.

OFFERED, 20 parts of "Intellectual Observer;" Anstead's "Ancient World;" Agassiz & Gould's "Comparative Physiology;" Parkhurst's "Greek-English Lexicon;" "Sermons of Latimer;" "Writings of Hooper." Wanted, Ramsay's "Geology of N. Wales;" Huxley's "Lay Sermons," and "Science and Culture;" and any vols. of "Quarterly Journal of Geological Society," previous to year 1873.—J. Bickerton Morgan, F.G.S., 30 Severn Street, Welshpool.

OFFERED, *Nassa neritea, Oliva ispidula, O. tremulina, O. reticularis.* Wanted, *Nassa immersa, Cyclostoma ligatum.*—W. Jones, Junr., 27 Mayton Street, London, N.

WANTED to exchange imagoes of *Cossus ligniperda*, leucophearia, fascelina, pilosaria, *P. chi*, privet hawk. Desiderata numerous.—Thomas Brown, 7 Hollings Terrace, Bradford.

WANTED, an oblong aquarium 20 to 24 in. State requirements.—W. F. Kelsey, Maldon, Essex.

SHELLS for exchange, including Australian and other foreign species, and a few British marine. Foreign helices not in collection particularly desired.—W. A. Gain, Tuxford, Newark.

OFFERED, clutches and nests of black-head bunting, whitethroat, sedge-warbler, greenfinch, linnet, &c. Wanted, yellow wagtail, garden warbler, blackcap, whitethroat, bullfinch, goldfinch, &c.—W. D. Carr, Lincoln.

OFFERED, *Helix sericea, Cochlicopa tridens, Zonites nitidus, &c.* Wanted any varieties (named) of *Helix virgata, caperata, cantiana, aspersa, arbustorum, pisana* and *ericetorum, Pupa marginata* (type) *Clausilias Rolphii* and *biplicata, Achatina acicula.*—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

WANTED, coins of Edward III. Groats, half-groats, pennies, half-pennies, farthings and any others of Edward's coins. Also wanted an old collection of foreign stamps in return for rare shells, microscopic objects, fossils, micro-sections and polished geological specimens.—T. E. Sclater, Bank Street, Teignmouth.

WANTED, named butterflies in cases. Various kinds of sea-eggs, excepting sphœra and miliaris, also *Avicula hirundo, Isocardia cor, Mangelia striolata, Vertigo moulinsiana, V. pusilla, Limnæa involuta*, and *Acme lineata*, above wanted in return for *Scalaria clathratula, Pleurobranchus membranacea, Eulima bilineata, E. distorta* and *E. polita, Mytilus edulis, V. pallida* (very rare), *Odostomias.* Rare kinds of rissoas, chemnitzia, and other rarer shells. List sent. —A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, Devonshire.

OFFERED, "Modern Science and Modern Thought," (S. Laing), "Problems of the Future" (S. Laing), and the following sixpenny edition of Kingsley's works "Westward Ho," "Two Years Ago," "Hereward the Wake," "Yeast," "Allan Locke," and "Hypatia," in exchange for vol. 1. Jeffery's "British Conchology," or offers in European and exotic land and freshwater shells.—Charles Pannell, Junr., East Street, Haslemere.

OFFERED, part iv. of vol. 26, "Trans. Linn. Soc." on fossil cycads; with 12 plates and odd parts of "Journ. Linn. Soc." Wanted, foreign land and freshwater shells, foreign beetles, or micro slides.—George Parish, 124 Kingston Road, Oxford.

DRUMMOND'S "Nyassaland," Ronald Smith's "Stanley," Kingsley's "Hypatia," "Yeast," "Westward Ho!" Dickens' "Dombey & Son," Scott's "Ivanhoe," Mark Twain's "Innocents Abroad," Lubbock's "Pleasures of Life," parts 1 and 2. All paper-backed editions; clean. Exchange for micro-slides. —X. Y. Z., 76 Clifton Street, Lytham.

SOWERBY'S "Illustrated Index of British Shells," 1859 ed. 1 or 2 plates slightly stained, Burrow's "Elements of Conchology," 28 plates, original boards, clean. Desiderata, Jenyns' "Monogr. of Cyclas," Turton's "Manual," Gray's edition; "Zoologist," for 1888-9-90.—W. E. Collinge, 41 Springfield Place, Leeds.

OFFERED, *Pis. roseum, fontinalis* var. cinerea and pulchella, *pusillum* var. grandis, *Surr. elegans* var. ochracea, *Sp. corneum* var. nucleas, *Cl. rugosa*, var. tumidula, and many other vars. Wanted, *A. lineata* vars. substriata and one or two others, and albina vars. of any species.—W. J. Farren, 15 Lorne Street, Fairfield, Liverpool.

WANTED, any or all of the following numbers of SCIENCE-GOSSIP: Nos. 217, 218, 219, 232 and 238. Offered in exchange, any Nos. in 1882 (except January).—P. Thompson, 19 Guerin Street, Bow, London, E.

OFFERED mounted slides of cancerous liver and other human tissues in exchange for embryology slides, Darwin's works, or what offers.—O. T. Elliot, Belgrave, Leicester.

WANTED, good unmounted material, also foreign shells and butterflies. Exchange choice micro-slides, anatomical, double stained botanical, diatoms, parasites, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

WILL exchange a large spring net trap, for catching all kinds of small birds alive, for natural history books, &c., or a first issue jubilee sixpence. Offers.—H. Knights, Northdenes, Great Yarmouth.

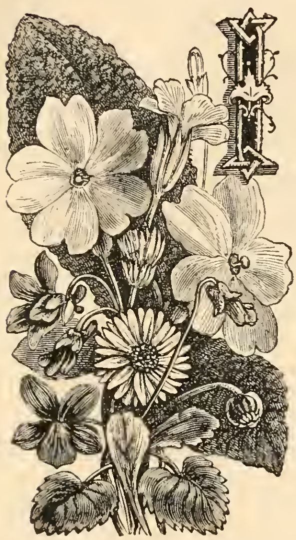
WANTED, *P. Podalirius, P. Apollo, P. Delius*, or any other European or exotic lepidoptera; in exchange for American *S. Cecropia, T. Polyphemus, T. Promethea, T. Cynthia, &c.*, or book-pattern store boxes, glass top boxes, &c.—R. Laddiman, Upper Hellesdon, Norwich.

BOOKS, ETC., RECEIVED.

"The School Calendar and Handbook of Examination."—"Twentieth Annual Report of the Entomological Society of Ontario."—"Journal of Royal Microscopical Society."—"Canadian Entomologist."—"Report and Transactions of the Guernsey Society of Natural Science and Local Research."—"Transactions and the Thirty-seventh Annual Report of the Nottingham Naturalists Society."—"A Theory of the Sun's Radiation of Heat," by W. Goff.—"Are Hawks and Owls Injurious to Game?" by W. J. Clarke.—"Handbook for Lincolnshire," (London: John Murray).—"Authenticated List of the Birds of Herefordshire," by George Horne (Birmingham Naturalists' Printing Co.).—"Annals and Magazine of Natural History."—"Through North Wales with a Knapsack," by four Schoolmistresses (London: Kegan Paul & Co.).—"Freshwater Algæ," by M. C. Cooke (London: Kegan Paul, Trench, Trübner & Co.).—"Advanced Physiography," by John Mills (London: Chapman & Hall).—"Zoological Types and Classification," by W. E. Fothergill (Edinburgh: James Thin).—"Vegetarian Messenger."—"Photographic Quarterly."—"Canary Book."—"British Cage Birds."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Book Chat," &c., &c.

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

NOTES ON THE COLOURS OF MINERALS.



IN the examination of a collection of minerals we find that many of them are coloured, for instance sulphur is yellow, cinnabar red, sapphire blue, fluor-spar blue, violet, yellow, green, etc.

Now some of these colours are really due to the substance which is the chief component of the mineral; this is the case with sulphur, which element is yellow, and with cinnabar (mercuric sulphide) which in one form is of a vermilion colour. But in the case of such as sapphire and fluor-spar the colour is due to the presence of small quantities of other bodies.

It is to the latter class that I wish to call attention. These minerals have not been systematically investigated as to the cause of their colours.

The following is a list of the minerals which I have up to the present time been able to examine:—

EMERY.—Composition $Al_2\ O_3$. This substance when pure is white, but it generally occurs of various shades of brown, the colour being due to the presence of ferric oxide, which varies in amount from 8 to 33 per cent.

TINSTONE.—Composition $Sn\ O_2$. When pure is white.

Black.—The black variety is coloured by ferric oxide. In one specimen Liversedge found 2·3 per cent. of ferric oxide and 0·8 per cent. ferrous oxide.

Brown.—Brown tinstone is also coloured by ferric oxide.

QUARTZ.—Composition $Si\ O_2$. Often occurs colourless or white.

Rose Coloured.—The colour of this variety of the mineral has been attributed to manganese and also to organic matter. Fuchs found in specimens from Robenstein in Bavaria 1 to 1·5 per cent. of oxide of titanium. On examination of several specimens of this mineral it was found that they did not change colour or become colourless on heating, showing the absence of organic matter; manganese was also absent in every case. All the specimens contained ferric oxide, and to this body the colour is therefore attributed. The presence of oxide of titanium in the rose quartz examined by Fuchs is not sufficient to explain the colour.

Violet Quartz.—The colour of this mineral, which is known as the common amethyst, has been attributed to the presence of manganese; it has also been stated that the colour is due to a ferrate; and Rose found in one specimen 0·5 per cent. of ferric oxide and 0·25 of potassium oxide, which result led him to believe that a ferrate was present in the mineral.

Several specimens of this mineral were examined, and it was found that they became colourless on heating, and did not afterwards regain their colour. They all contained iron, but manganese and organic matter were absent. Owing to the small quantity of iron present it was found impossible to determine in what state it exists in the mineral, but it seems probable that the colour is due, as stated by Rose and others, to a ferrate, which becomes decomposed by the action of heat, rendering the mineral colourless.

Yellow Quartz.—A transparent variety of this mineral on heating did not lose all its colour, but became of a lighter shade. The colour was found to be due to a small quantity of ferric silicate. The colour of an opaque variety was due to ferric hydrate, which latter was easily dissolved by hydrochloric acid, leaving the quartz colourless.

Smoky Quartz.—The colour of this mineral has been attributed to allotropic modifications of silica, and also to organic matter. A. Foster found that on distillation this mineral yielded a small quantity of a brownish liquid containing ammonium carbonate, and from this supposed that the colour of the mineral was due to an organic substance containing carbon and nitrogen.

On examination of specimens of this mineral, it was found that they became colourless on heating, cracking to pieces, and yielded a small quantity of a liquid containing no ammonium carbonate as stated by Foster: it was, in fact, water. On further examination the colour was found to be due to disseminated ferric hydrate, which decomposed on heating, giving up its water.

CORNELIAN.—A variety of quartz.

Red.—The colour is due to ferric oxide.

BEELSITE.—A variety of chalcedony. The colour of a red variety of this mineral was also due to ferric oxide.

JASPER.—Another variety of quartz, occurs of various colours.

Red.—The colour of the red specimens is due to ferric oxide.

Yellow.—Yellow jasper is coloured by ferric hydrate.

FLINT.—Many specimens of this mineral were examined; the colour of red, brown, grey, and black flint was found to be due to the presence of a small quantity of ferric oxide, and the yellow and brownish-yellow to ferric hydrate.

OPAL.—Composition $Si\ O_2$ with water. When pure, is white.

Red.—A red variety of this mineral was coloured by the presence of ferric oxide.

BLENDE.—Composition MS. Pure zinc sulphide is white.

Black.—The colour of the black variety of this mineral is due to ferrous sulphide. Various analysts have found iron to the amount of 1·18 to 14·32 per cent.; the iron occurs as ferrous sulphide, and thus gives the mineral a black colour.

COMMON SALT.—Composition Na Ce. When pure, is colourless or white.

Pink.—The colour of a pink variety of this salt was found to be due to a small quantity of manganous chloride.

Red.—The red variety owes its colour to enclosed ferric oxide or a reddish clay, which occurs in the salt formations.

FLUOR SPAR.—Composition $Ca\ F_2$. This substance when pure is colourless or white, but as a mineral it occurs in all colours.

Purple Fluor.—The various colours of fluor spar have been attributed to organic matter, and to the molecular structure of the mineral. Schrötter found in the dark blue fluor of Wölsendorf, Bavaria, 0·02 per cent. of ozone, which Schonbein has shown to be antozone, and he gave the name antozonite to this mineral. Schafhäutl found in this fluor 0·02073 per cent. nitrogen; 0·00584 hydrogen; 0·0365 carbon; and 0·08692 chloric acid. Wyrouboff also examined the mineral and found in it 0·0025 carbon; 0·0038 hydrogen, with 0·0180 alumina; 0·0032 ferric oxide; 0·0025 ferrous oxide, and 0·007 of chlorine. Wyrouboff attributes the colour to compounds of carbon and hydrogen derived from the water that deposited the fluor spar.

The following results were obtained on examination of several specimens:—

On powdering one of the specimens it gave a very peculiar odour, but it was gone instantly. This is somewhat like the one examined by Schrötter, as it is stated that the odour from it is so powerful as to cause headache and giddiness in the miners who work amongst it.

On heating, the mineral gives a very beautiful violet fluorescence, and the fluor becomes first violet and then quite colourless. They all contained manganese, but no organic matter. The manganese was present as fluoride.

From these results it is difficult to say to what the colour is really due. It certainly is not due to organic matter, and the manganous fluoride detected in it, though of a violet colour, is not dark enough to give the purple colour to the fluor-spar. This must be left for further experiment.

Green Fluor-spar also gave a violet fluorescence on heating, and the colour was found to be due to a small quantity of ferrous silicate.

Yellow Fluor-spar is coloured by the presence of ferric hydrate. On heating, this mineral becomes red.

GYPSUM.—Composition, $CaSO_4\ 2H_2O$, when pure is colourless or white.

Red varieties of this salt are coloured by ferric oxide.

WEBSTERITE.—When pure is white.

Yellowish-brown.—The colour of a yellowish-brown specimen was found to be due to ferric hydrate.

CALCITE.—Composition, $CaCO_3$. When pure is colourless or white.

Yellowish-red.—A yellowish-red variety was found to owe its colour to ferric hydrate. On heating it cracks to pieces and becomes brown.

Peachblossom Coloured.—The colour of this specimen was found to be due to cobalt carbonate.

Pink Calcite.—A pink variety of marble on examination showed that the colour was due to manganous carbonate, of which it contained 0·37 per cent. Specimens of this variety of marble have before been examined by Roué, who found 1·13 per cent. of manganous carbonate, and a specimen from Nantlle Valley, Carnarvonshire, contained as much as 8 per cent. of the same.

Black.—Bischof found in a black limestone 1·15 per cent. of ferrous carbonate.

Upon ignition this marble becomes quite white, and the colour is due to disseminated carbon, which burns off on heating.

The presence of ferrous carbonate in the limestone examined by Bischof, is not sufficient to explain the black colour.

ARAGONITE.—Composition, $CaCO_3$. When pure is colourless or white.

Yellowish-red.—A yellowish-red variety of this mineral was coloured by ferric oxide.

Red.—The red specimens are also coloured by ferric oxide, sometimes manganese is also present.

SPATHIC IRON ORE.—Composition, $FeCO_3$. When pure is white.

Pink.—The colour of a pink variety of this mineral was found to be due to the presence of a small quantity of manganous carbonate.

Black.—This mineral was found to be coloured by the presence of carbon.

WAVELLITE.—Composition, $3Al_2O_32P_2O_512H_2O$. This body when pure is white.

Blue.—Erdmaun found in a specimen of this mineral 1 per cent. of ferric oxide. Turquoise is a blue variety of wavellite, and has been examined by Church, who found 2·21 per cent. of ferrous oxide and 5·27 of cupric oxide, also by Hermann who found 1·10 of ferric oxide and 2·02 of cupric oxide. The colour of the blue wavellite was found to be due to the presence of phosphate of copper, thus it approaches to turquoise in composition.

SCHORL.—The formula of this mineral is very complicated. The name is generally applied to the black varieties of Tourmaline.

The colour is due to ferrous and ferric silicates; the combination of the two silicates forming the black colour.

MUSCOVITE.— (Common Mica). Composition $K_2H_4Al_6Si_6O_{24}+H_8Si_{10}O_{22}$. This mineral when pure is colourless.

Brown.—The colour of this variety was found to be due to both ferrous and ferric silicates.

Black.—The colour of this mineral was also due to the two silicates of iron.

LEPIDOLITE.—A variety of mica containing lithuimi, often found colourless.

Peachblossom Coloured.—This colour is due to the presence of a smaller quantity of manganous silicate.

TALC.—Composition, $Mg_4Si_5O_{14}H_2O$. When pure is white.

Yellow.—The colour of this mineral was found to be due to a small quanty of ferric silicate.

Red.—This variety is coloured by the presence of ferric oxide. Treatment with hydrochloric acid dissolves the ferric oxide, leaving the talc colourless.

Black.—Black talc owes its colour to both ferrous and ferric silicates.

ACTINOLITE.—Composition (Ca, Mg, Fe), SiO_3.

Green.—It will be seen from the composition of the mineral that it owes its colour to ferrous silicate, which is a component of the green mineral.

ASBESTOS.—Composition, $CaSiO_83MgSiO_3$. When pure is white.

Green.—This mineral is coloured by the presence of ferrous silicate, which replaces the other silicates to a certain extent.

Greyish-Green.—Is also coloured by th: presence of ferrous silicate.

EPIDOTE.—Formula very complicated.

Green.—This mineral contains ferrous silicate as an essential ingredient, therefore the colour is due to that body.

AXINITE.—Formula very complicated.

Greyish.—This mineral was coloured by the presence of both ferrous and ferric silicates.

SERPENTINE.—Composition, $MgSiO_3$, Mg_2SiO_4 $2H_2O$. When pure is white.

Green.—The colour of this variety of the mineral is due to ferrous silicate, which varies in amount from one to fourteen per cent.

Red.—The colour of the red variety of serpentine is due to ferric oxide.

GARNET.—Formula variable. Pure garnet is white.

Dark-red.—The colour of dark-red garnet is due to both manganous and ferric silicates, ferrous silicate is present in some and perhaps slightly modifies the colour.

HYPERSTHENE.—Composition, (MgFe) SiO_3.

Green.—It will be seen from the formula that the colour of this mineral is due to ferrous silicate, which is a constituent of the mineral.

STILBITE. — Composition, $CaAl_2Si_6O_{16}5H_2O$. When pure is white.

Red.—Red varieties of stilbite are coloured owing to the presence of both manganous and ferric silicates which replace to a certain extent the silicates which are the real components of the mineral.

STEATITE.—Composition 3 Mg Si O_3, H_2 Si O_3. When pure is white.

Bluish-Green.—The colour was found to be due to ferrous silicate.

AUGITE.—Composition (Ca Mg Ee) Si O_3.

Black.—The black varieties owe their colour to both ferrous and ferric silicates.

FELSPAR.—Composition K_2 O, Al_2O_3, 6 Si O_2. When pure is white.

Red.—The colouring varying from flesh-red to very dark red is due to varying amounts of ferric oxide.

On looking at the results of these analyses we find that the colouring agents are very few in number; viz. carbon, cobalt salts, manganous salts, ferric oxide, hydrate, and silicate, and ferrous salts, the presence of organic matter other than carbon is very doubtful. The above may be arranged as follows :—

Pink colours are produced by Manganous and cobalt salts.

Red colours are produced by Ferric oxide, manganous and ferric silicates.

Yellow colours are produced by Ferric hydrate and silicate.

Brown colours are produced by Ferric oxide and silicate.

Green colours are produced by Ferrous silicate.

Blue colours are produced by Copper salts.

Black colours are produced by Carbon, and Ferrous and ferric silicates.

FISHING IN SEA-PUDDLES.

Salcombe.

FROM the rough map of Salcombe estuary which is given with these notes it will at once be seen what a favourable spot there is on the coast of South Devon for those whose tastes lie in the direction of marine zoology. Visiting the small fishing-town, which is about sixteen miles away from Kingsbridge Road station, in July last, I was struck with the irregular conformation of the inland estuary, suggestive—at high water—of a miniature Sydney harbour with arms of the sea penetrating in all directions. In the unoccupied intervals of a fishing excursion, when bass and pollack were outward bound, and spring tides exposed the lowest tidal rocks in a convenient manner, I betook myself to the pools amongst the mottled red and green gneiss rocks to see what might be seen and gather treasures from the deep. I suppose Couch, Peach, and Gosse knew

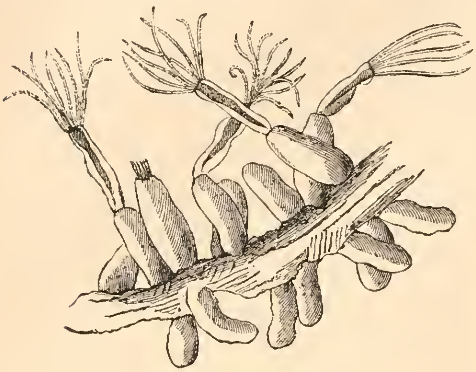


Fig. 108.—*Farrella repens.*

Figs. 109.—*Crisidia cornuta.*

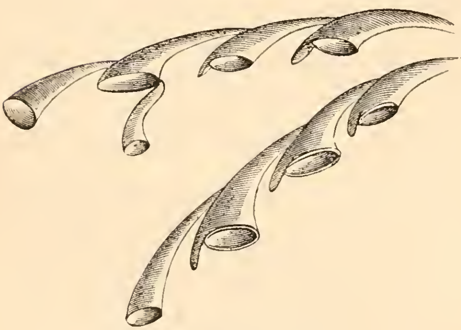
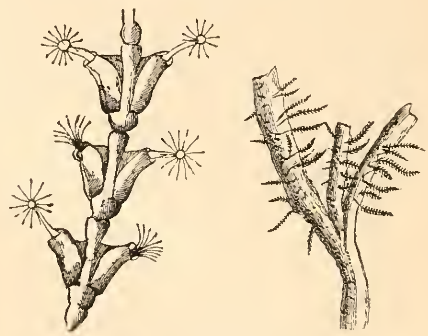


Fig. 110.—*Eucratea chelata.*



Figs. 111.—*Sertularia pumila.*

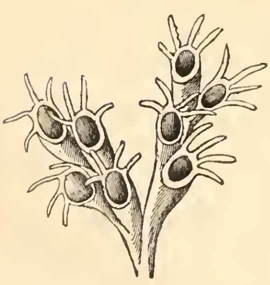


Fig. 112.—*Cellipora reptans.*

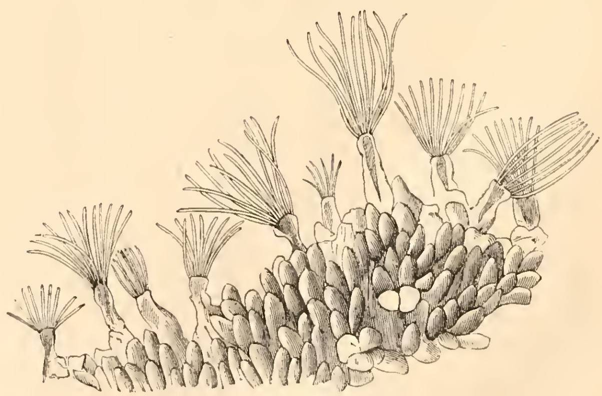


Fig. 113.—*Cycloum papillosum.*

every inch of these Devonshire coasts, and the south-western marine fauna is peculiarly rich, although, in my opinion, no richer than the shores of the Isle of Wight, which I had worked in previous years; still there is more than enough at Salcombe for the most omnivorous worker, and I soon found myself with many a bottle of stuff awaiting examination at home.

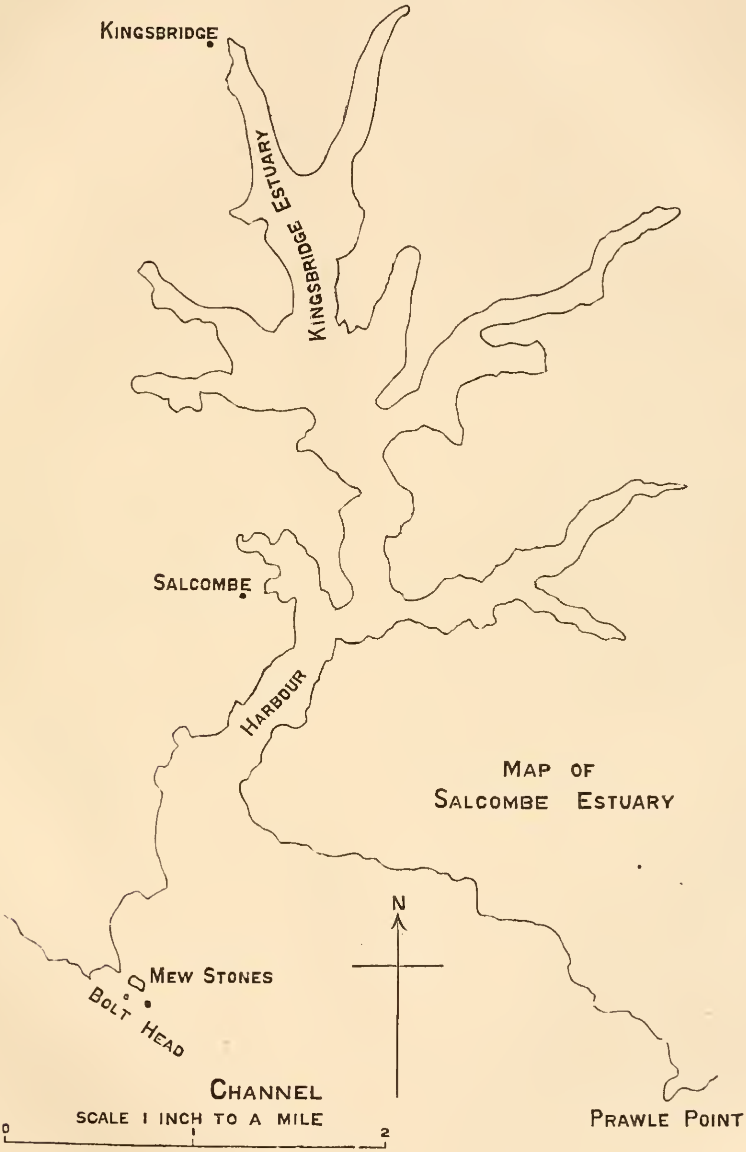


Fig. 114.

A chance occurrence served to rekindle my interest in the Hydroids and parasitic Polyzoa. A hook at the end of five fathoms of fishing-line brought up to the side of our boat a frond of some olive-coloured Fucus. Attached to the weed there was the gelatinous sac of a tiny hydroid, *Lucernaria auricula*, which expanded in the water like an olive brown lily barely a quarter of an inch in height, with eight clusters of tentacles and masses of ovules within the bell-shaped body. The next morning I was peering once more into still and quiet tidal pools in the old familiar style, smashing pickle bottles now and then on slippery rocks, or landing on my back in unexpected places.

There was no occasion to wander far away. A huge cleft in the rocks formed a natural aquarium all ready at hand, where algæ such as Laminaria, Fucus, Chondrus, Ulva, Amphora, and many others flourished. At high tide the whole shore was covered, while even at the lowest ebb an ample supply of sea-water remained in the pool to sustain the exuberant life. Three varieties of that non-contractile anemone *Anthea cereus* first attracted my notice. The one had the tentacula sea-green coloured, each having a rosy-pink tip, the others were slate and fawn respectively, without the tipped tentacles. *Actinia crassicornis*, with crimson body and white tentacles ringed like porcupine quills, was less generally distributed. The ova of brittle stars embedded in a mass of slate-coloured jelly covered the surface of one rocky ledge, and the ova of various mollusca lurked beneath the stones. The silvery white cells of *Membranipora pilosa* and *M. membranacea* infested the fronds of most suitable weeds; the polyps expanded vigorously under the microscope a few hours later. With the inch objective I have found the spinous cell structure can best be studied on a transparent frond of Ulva: every detail is then visible, whereas on thick algæ it is extremely difficult to observe the growth with precision.

Three other kinds of Polyzoa appeared abundant at this spot, all well worth a patient examination. The enormous polyps of *Flustra hispida* could be seen with the naked eye projecting from brown masses of the fleshy substance adhering to Fuci, Jania, Chondrus, etc. A Codrington lens shows the five spines surrounding the rim of each cell. The polyp is of splendid form, with at least twenty ciliated tentacles creating an incessant vortex for the necessary food supply of the animal. Sometimes on the very same weed I found the equally beautiful colonies of *Cycloum papillosum*, with the polyps shooting out from conical cells forming ridges along the edges of a frond which—under the inch power, resembled a chain of miniature mountains. Somewhat different in growth from either of the above, I found the creeping stems of *Farella repens*, with the more elongated polyps, having about twelve tentacles, encased in sacs united to the common stem but standing apart from each other. These, with *Sertularia pumila*, were common everywhere, whilst a Lepralia (sp.) encrusting the stones and roots of a Laminaria, here very plentiful, was new to me, the only one of its genus that I have ever seen with a bright orange-coloured polyp. The outer wall of the cell was silver-white, profusely punctured on every side; the rim appeared to be contracted in an irregular circle, a second cavity being visible below the real cell and quite distinct from it. Each cell had a short spine at one side, and an operculum or lid above it; the rows of cells were regular, and equidistant, the animals having eighteen tentacles ciliated and orange in colour. Relying on an old edition of Johnson's "British Zoophytes," I have been unable to identify the species; if there is any correspondent of SCIENCE-GOSSIP who has access to Hinck's "Polyzoa," I shall feel indebted if he will determine the specific form of Lepralia if possible from my description.

Attached to a species of Polysiphonia the club-headed and naked polyps of *Coryne pusilla* grew plentifully, easily detected under the microscope by the cable-like stem, and reddish tentacles, each one swollen at the head. The graceful *Laomedea gelatinosa* had the ovarian vesicles very fully developed, and several free swimming bodies in the same trough I took to be the medusoid form of the same polyp. On *Sertularia pumila* the lively *Pedicellina echinata* was busily engaged in frantic efforts to knock off his own head—a feat that it often achieves only to develop a fresh head. At the first glance the creature might be mistaken for a thick and heavy-looking Vorticella; but the cilia of the short tentacles and digestive organs soon reveal the higher organisation of the Polyzoa. *Plumularia primata* grew on the surface of the bare rock, and amongst the other stray genera I collected *Bowerbankia imbricata*, *Cellularia reptans*, *Campanularia dumosa*, *Crisia cornuta*, *Eucratia chelata*.

Amongst the hydroids I gathered half-a-dozen specimens of *Hydractinea echinata* for the first time. As far as I could detect there was no covering or tube to the sluggish polyp. The eight tentacles were not on the same plane, but stuck out at different angles, and had granulations like a hydra. The mouth or terminal orifice was very distinct. A charming little white anemone striated on the body and having several rows of white tentacles, I took to be *Actinia alba*, the body being barely an inch in circumference. Beneath a shelving rock which had been recently washed by the tide the most brilliant sponges, algæ, and sea anemones grew, the orange, yellow, red and green hues being beyond description.

On a root of Plocamium several white bodies attracted my attention. It was a group of *Sycon raphanus* (*vide* Text-book of Zoology, Claus-Sedgewick). The ovate individuals, constricted at the base, showed the mouth or osculum fringed with spicules standing erect. A longitudinal section also revealed the radial tubes opening into the central cavity, as well as spicula.

A friendly fisherman who saw me at work amongst what he styled "the live stones," brought an offering in the shape of a splendid Echinus fresh from his lobster pot. The bristly shell measured eighteen inches in circumference and six inches in depth. The spines were in vigorous motion, together with the filamentary pedicellariæ, which were armed with a gaping process divided into four parts. Placed in a basket of sea water, the creature protruded the ambulacral organs to the length of nearly two inches, a knot or sucker terminating every one. The lips and teeth were visible around the mouth, the stone canal having an exit near to the vent. A more beautiful sight than this animal in full motion can hardly be conceived, and the size seemed to me remarkable for the littoral of the southern English coast. It was amusing to compare the progression of the brittle stars and star-fishes with the more deliberate movements of the sea-urchin.

Even while I write these notes I have a basin crowded with a host of unidentified creatures. One sea anemone has an elongated, slender, orange-red body two inches high, crowned by a mass of filiform, white tentacula; another small fellow, half buried in sand, with white ribs externally on a greyish-pink body, and short annulated tentacula, may be *A. gemmacea.* There are clusters of ova without number, larval forms of crabs, worms such as the Spirorbis and Terebellum, a Chiton and other queer beasts in full activity. I suppose there are those who have mastered the life-history of each and every one of these marine animals; but most of us with only a few days at a time by the sea-side can merely touch the borders of the subject and admire the fairy kingdom of the exquisite pools. Of this, however, I am quite certain, those who give the Salcombe estuary a trial will not come away empty handed or disappointed; there is almost too much to be gathered in the rocky tidal pools.

From a fresh bottle full of *débris* I have just discovered another batch of zoophytes including the rare *Beania mirabilis*, a single specimen of *Tubularia dumortierii*, *Hippothoa catenalaria*, *Anguinaria spatulata*, *Campanularia volubilis*, with half-a-dozen others. *Actinia bellis* is on the rocks, but can hardly be removed alive.

C. Parkinson, F.G.S.

A WEEK'S HOLIDAY IN THE SOUTH OF FRANCE.

A LITTLE village situated on the national route, and about a couple of miles from the river Rhône, has been my headquarters for the following excursions, which, with one exception, were made within a short distance.

The place is a beautiful hunting-ground for botanists, for it lies between the ramifications of the Alps and the river banks of the Rhône. The climate is known as that of morel and fig trees. Formerly plenty of silk-worms used to be reared; less so now because of the disease.

The soil is of alluvian character, stony and sandy in some places, very dry in summer time, crossed by many torrents, where water is only to be found in wet seasons, or after tempests.

The vegetation is accordingly very varied, forming a transition between Alpine and flat-land plants on one hand, and northern and true southern plants on the other.

The botany of this place is very little known; there is no special flora for the whole county (Drôme), and I fear no botanist of note has ever visited it.

Many an interesting plant is to be found, if one has time enough to make careful search; still, in half a dozen rambles I have collected over one hundred and eighty different species of uncommon plants, and this is, I think, a respectable number.

Just taking a walk the day of my arrival at my father's farm, I picked up *Ornithogalum umbellatum*, *Neslia paniculata*, *Bunias erucago*, *Ajuga chamæpitys*, *Iberis pinnata* (very abundant), *Reseda phyteuma* (rather early for it), *Bromus maximus*—all the above in a corn-field; and in a piece of lucern by its side there was a broom rape rather abundant, which puzzled me at first; at last it turned out to be *Orobanche rubens.*

In a wet meadow, where a little brook was quietly flowing, I found *Carex tomentosa*, *panicea*, *distans*, *ampulacea*, *Orchis laxiflora*, *latifolia*, *maculata*, *Linum angustifolium.* The vineyard of a stony nature furnished me with *Hutchinsia petræa*, *Mibora verna*, *Seneciogallicus*, *Pterotheca nemausensis*, *Cynodon dactylon.* This last is the pest of the country, growing everywhere in great abundance; it flowers rarely, and is known to the countrymen as "Chien-dent" (Engl. = Couch-grass), although the true couch-grass is *Criticum repens.* The following day I went a little farther on, by the side of a dry torrent bed. The first thing I met with was *Aristolochia rotunda*, growing in patches under dwarf willows, then *Ophrys aranifera* (Huds. var.), *pseudo speculum*, mixed with *Loroglossum hircinum. Genista scorpius* was then secured; it is a low bush, looking like a gorse, and very prickly too, growing on all dry stony boulders.

The pretty rush-like *Aphyllanthes monspeliensis* grew in big clumps in many places, mingled with *Astragalus glyciphyllos.* Under the shade of white locust-trees stood upright *Euphorbia lathyris*, *E. Gerardiana;* and by their side, *Thlaspi perfoliata.* On a dry stony bank a little further on, furnished here and there with varnish-trees, I found growing together *Scrophularia canina*, *Fumaria procumbens*, *Coronilla minima*, *Argyrolobium Linneanum*, *Dorycnium suffruticosum*, *Carex precox*, *Asperula arvensis.* The remains of an old wall was clothed on the north side with *Ceterach officinarum*, *Aspleinum trichomanes*, *A. Ruta-muraria;* on the top stood here and there *Euracastrum obtusangulum.* In a grassy corner there was the pretty *Trifolium stellatum*, further a few *Orchis simia.* The last find was a bold *Linum*, *L. narbonnense*, in a hole among the stones of the torrent.

The next day I went on the side of the Rhône, upon an islet formed by a branch of the river; there, as well as all along the sides of the river, the soil is more or less pure grey sand washed by the waters, the trees and bushes consisting chiefly of poplars, alders, and willows of different species.

An ample harvest was made in a few hours. I found again, and still more plentiful, *Orobanche rubens* upon Medic roots, about six different colours, varying from very pale straw colour to deep violet. I also got *Orchis militaris* in such a luxuriant growth that it might have competed for beauty with epiphyte orchids. Then *Anthyllis vulneraria*, in big and vigorous clumps, though there was not the smallest bit of chalk. *Asclepius cornuti*, covered large patches, but was not in flower yet. I may perhaps write a few lines upon this plant, out of which a new business has lately sprung up. The most important others were: *Euphorbia Gerardiana*, *E. verrucosa*, *Thalictrum aquilegifolium*, *Œnothera biennis*, but not in flower yet; *Orchis laxiflora*, *maculata*, *Platanthera montana*. *Phleum arenarium*, the southern form, with single upright small stem, *Silene conica*, *Vulpia ciliata*, *Polygala comosa*, pink and blue in big clumps; *Astragalus cicer*, not in flower yet, *Scleropoa rigida*, etc., etc. I turned then to practical botanising, as I quickly gathered a bunch of wild green asparagus, which I enjoyed very much the following day. On my way back I crossed a low-lying meadow, where the poet's narcissus revelled; indeed, there was so great a number that one hundred bunches might have been gathered at a time. *Orchis ustulata* grew among them, although it is a very different place where I usually collect it.

The fourth day I made my farthest excursion to Condillac, a little village in the mountains only known because of its source of mineral water. There is a beautiful old castle surrounded by the ruins of the old village. I think it would be an interesting ground for archæologists.

In the woods around I quickly found several interesting plants, such as *Orchis simia*, *Saponaria ocymoïdes*, a beautiful trailing plant which adorned the boulders; *Astragalus monspessulanus*, *Cytisus sessilifolius*, *Genista pilosa*, *Amelanchier vulgaris*, *Thymus vulgaris*, *T. serpyllum*, var., *Helianthemum polifolium; Cephalanthera ensifolia*, in so great a number that I made a small bouquet of them, which might have well passed for a bride's bouquet. Also *Cephal. grandiflora*, but not so abundant; then *Anchusa capensis*, etc. Crossing under low bushes I met with a patch of the pretty *Lithospermum cœruleum*, which I had never collected before. On my return I stopped the carriage to pick up a big clump of *Euphorbia serrata*, and by the road sides I got at the same time *Vicia peregrina* and *Vicia hybrida*, a near ally to *V. lutea*, having hairy flowers and pods.

Another afternoon excursion near home, on some hillocks called "Les Blaches," proved very productive too. I collected *Herniaria hirsuta*, *Medicago minima*, *Trigonella monspeliaca*, *Alyssum montanum*, *Coronilla minima*. In a rye field I found again *Bunias erucago*, *Myosotis stricta*, *Caucalis daucoides*, not in fruit yet; *Aira caryophyllea*, var. *multiculmis*. On declivities, *Orchis simia*, *Loroglossum hircinum*, *Ophrys apifera*, and again *Aphyllanthis monspeliensis*, *Fumaria procumbens*. A little dell was covered with *Bromus pratensis*, of a peculiar aspect, because of its grey hairy tinge. As it was getting late I stopped here my investigations, although I felt sure I would find something good had I had time to go further. Coming back I picked up on a bit of wall *Scleropoa rigida*, and by the roadside *Lotus corniculatus*, var. *villosus*, a dwarf starved plant, covered all over with long straight grey hairs.

My last trip has been to "Château de la Tour du Veyre," a very old castle in the mountain surrounded with lofty trees, lakes, groves, etc., the remnants of a former grandness.

On the way, by the embankments of another torrent, I got a lot of *Biscutella lævigata; Genista scorpius* was also there in plenty; indeed it replaces in this country the furze so common in the north. On getting there the first thing I met with was *Daphne laureola* (in fruit), then again *Cephalanthera ensifolia;* under wood, *Carex sylvatica*, *distans*, *Asperula galivide*, which I at first mistook for *Galium erectum*. In a quite shadowed bed of bushy trees *Arum italicum* revelled in great quantity; *Lamium incisum* was also found in a box edge-row; then *Genista pilosa*, *Lepidium draba*. I met along a corn-field *Kœleria cristata*, which was so numerous that it formed the chief grass of the border; among the corn was *Ranunculus arvensis*, *Caucales daucoides*, *Teucrium botrys* (the two last not good yet for collecting). Turning then homeward I found a single specimen of *Trifolium molineri*, a white variety of the crimson clover.

On a former visit a few years ago (about July) I collected the following plants: Sands of the Rhône: *Lysimachia vulgaris*, *Genista tinctoria*, *Scirpus rothii*, *Agropyrum glaucum*, *Scirpus holoschœum*, *Chlora perfoliata*. Dry banks of torrents: *Echinops ritro*, *Tunica saxifraga*, *Glaucium luteum*, *Trifolium tomentosum*, *aureum*, *scabrum*. Roadsides: *Catananche cœrulea*, *Teucrium polium*, *Plantago pryllium*. Under woods in the mountain: *Rubia peregrina*, *Campanula latifolia*, *cœrvicaria*. Dry sunny places: *Andropogon hirtum*, *Dianthus caryophyllus*, *Serratula tinctoria*, *Psoralia bituminosa*. In cultivated fields: *Medicago falcata*, *Euphorbia falcata*, *Nigella arvensis*, *Setaria verticillata* and *viridis* (which are here troublesome weeds,) *Linaria cirrhosa*, *Œgilops ovata*, *Convolvulus cantabrica*, etc., etc. By the above, one will be able to judge the richness of the flora of but a very small part of what I call "Vallée du Rhone." I am glad to say that I have duplicates of most of the above, whose list is to be found in "Exchanges," of this number.

S. MOTTET.

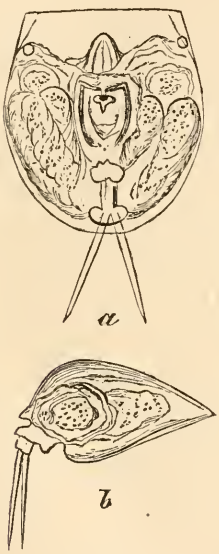
Paris.

IN a recent number of the "American Naturalist," Mr. G. Bauer gives a most interesting article on "The Gigantic Land-Tortoises of the Galapagos Islands."

NOTES ON ROTIFERS.

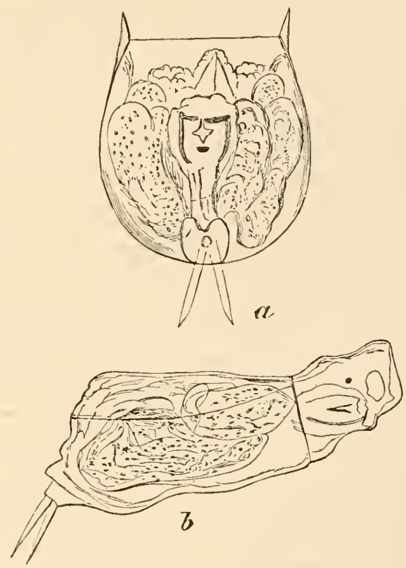
THE GENUS DISTYLA: CLASS ROTIFERA.

IN 1886 I contributed to SCIENCE-GOSSIP an Article on the genus Euchlanis, in which I figured and described several of the smaller and less-requently occurring forms of that genus, and predicted that in all probability fresh genera would have to be created for them. In the magnificent monograph of the Rotifera, by Messrs Hudson and Gosse, which subsequently came out, this prediction was verified, and the animals were placed in the new genera Cathypna and Distyla. A careful study, under perhaps exceptionally favourable circumstances of two of the species I then described, has given rise to more than the suspicion that the Rotifera of the latter genus are but the extended



Figs. 115.—*Cathypna Gossei.*

forms of the genus Cathypna. Indeed, so far as the two species referred to are concerned, I have no doubt whatever—when retracted they are undoubted Cathypnæ—when extended, as certainly would they be described as Distylæ. If this holds good of the remaining species, it will be evident that Mr. Gosse was in error in admitting the genus created by Eckstein. It may seem a bold thing for a humble and isolated worker like myself to venture to criticise the work of an acknowledged master like Mr. Gosse; a gentleman—to quote his colleague—"whose great knowledge and experience, his keen powers of observation, his artistic skill, and his rare gift of description are known to all, and have made him *facile princeps* among the writers on the Rotifera." In this eulogy by his colleague, I heartily concur, as I yield to none in admiration of his many great gifts; and indeed for years I enjoyed the privilege of his friendship, and frequent correspondence. However, if a mistake was made, it is easily accounted for. Much of the work was done under failing powers; (of eye-sight at least) some species (Diaschiza) were described from dead specimens only, and in one case at least, *D. Collinsii*) from imperfect drawings. Towards the end of the work, new species accumulated so fast, that it was utterly impossible to give them proper attention. When studying one form, another, equally new, frequently came into the field of view, and a hurried, and necessarily imperfect diagnosis taken, and drawing made. As a consequence, the characters of the species of several of the less-frequently occurring forms, notably in Proales, Colurus, and others, are not drawn with such precision as to render mistake impossible; and secondly, his notes on most of the charming Rotifera of the



Figs. 116.—*Cathypna Hudsoni.*

sub-order Loricata (Pterodinadæ, Brachionadæ, &c.) the very aristocracy of Rotatorial life, had, as he put it to me, "to suffer by painful compression," to make room for the numerous unexpected new species. I know that before the concluding part of their great work was in the hands of subscribers, Mr. Gosse had Notes and drawings of over sixty new species, for which no space could be found. Under such circumstances we need not be surprised if slight errors should have crept into a work of such magnitude; and it appears to me that microscopists would be doing good service by carefully going over the work as opportunities occur, and checking off the result. This article is a humble contribution to that useful, if somewhat thankless work. The Rotifera of the fam. Cathypnadæ, are distinguished by the "body being enclosed in a lorica, open at each end, of two plates; the dorsal more or less elevated, the ventral nearly flat; the two divided by a deep, lateral, longitudinal sulcus, covered with flexible membrane; toes two, or one (Monostyla) always exposed." The characters of the genus Cathypna, are as follows—"Lorica sub-circular horizontally, usually much arched vertically, lateral inangulation wide and deep; toes two, furcate." The genus Distyla is said to differ only "in the latter inangulation being feeble;" and having "selvage-like thickenings of the lorica around the foot." Mr. Gosse says that "the genus is closely linked with Cathypna, yet the flattened form, the habitual protrusion of the head, and the more constant activity of the species distinguish it." Now in these remarks, Mr. Gosse seems as if he were trying to convince himself, and he appears quite conscious of the necessity to point out very particularly the points of difference lest they should be overlooked. It will be seen how really slight these differences are, and as it will greatly assist us, if we rightly comprehend the differences said to exist between the two genera, I recommend microscopists to study the descriptions and figures published in the work referred to. I have myself prepared drawings of two species, upon which I more particularly found the conclusions arrived at in this paper.

We are now in a position to take Mr. Gosse's points seriatim. In both my specimens the lateral inangulation, and the arched dorsal plate are as strongly marked as in Cathypna (See Fig. 115 b). The form of the lorica both in mine and in Ehrenberg's *D. Hornemanii*, is as broad; and as to their activity, this is exhibited only when the animals are excerted: when retracted they are as characteristically sluggish. There only remains to note the distinction as to the "habitual protrusion of the head." This seems to me so abnormal a condition as of itself to cause suspicion. That an animal should have developed a protecting lorica, and that this should protect only its least vulnerable part, leaving exposed the whole of the forepart, with its enclosed brain and sense-organs—seems to require an explanation not as yet forthcoming. The Rotifera of the genus Cathypna, indeed, I might say of the fam. Cathypnadæ, are excessively lethargic; they may be watched for long periods, either asleep, or sluggishly moving their toes or languidly swaying to and fro without excerting their frontal part. I have myself had them under occasional observation for a week at a time, without seeing any other signs of life than the languid movements described. When however they do exert their frontal part, they are as vigorous as their congeners: and here, I believe, we have the explanation of the probable error. Late in the year 1886, I was examining some water and sediments from my now historic "Prolific Pond," when I saw a Rotiferon extended, which was new to me, of which I give a drawing (Fig. 115 c). This I watched at intervals for an hour or two without at all suspecting its relation to Cathypna, or indeed that it was a loricated form at all; when, from some unknown cause, the frontal part was suddenly retracted, and I at once recognised the animal so familiar to me in the earlier part of the year, which I had figured and described in SCIENCE-GOSSIP. (Fig. 115 a & b) in my "Notes on the Genus Euchlanis." Fig. 116 a & b occurred subsequently in the same water, and differs from Fig. 115 chiefly in its shorter toes, and in the anterior points on the lorica. How a Rotiferon with a lorica (like Fig. 115 a & b) can lengthen itself out in the manner depicted in Fig. 115 c, I cannot fully comprehend, but that it does so is indubitable. The lorica, I take it, must be excessively thin and membranous. Any one seeing a Rotiferon of my species of Cathypna extended, and in vigorous motion might easily be pardoned, if, remembering the broadly-oval form and sluggish habits of the Cathypna, he concluded he had under observation an animal of a different genus. It is of course possible that Distyla may be a good genus, but it is, I think, at least probable, that some, if not all the species of that genus have been described from extended Rotifera of the genus Cathypna. Dr. Hudson somewhat complacently remarks that he has now managed to get every known Rotifer into his net; but my two species are, I believe, new, and I propose to name Fig. 115 *Cathypna Gossei*, & Fig. 116 *C. Hudsoni*. Both closely resemble the Euchlanis (Distyla) Hornemanii of the illustrious Ehrenberg, and it is very significant that he describes that species as being "soft, flexible, elongated, *and capable of retraction*." I submitted my drawings and Notes to Mr. Gosse, who was very much impressed, and urged me to follow up the investigation and let him know the result. Unfortunately, two large bleach-works were started in close proximity to my "Prolific Pond" and very effectually put an end to my researches. It does not require a phenomenal knowledge of chemistry and biology to know that Rotatorial life and chlorine, and many of its compounds are incompatible. I trust that those microscopists who have the opportunity will take up the investigation of this subject, and whether the result be to confirm the genus, or my suspicions as to its non-existence, my purpose in writing these Notes will have been accomplished.

J. E. LORD.

Rawtenstall.

THE COLOUR AND FERTILITY OF BIRDS' EGGS.

IN a previous issue of this journal I ventured to state that there was a strong relation between the colour and fertility in the eggs of wild birds. I again beg to offer some further remarks, which may, perhaps, meet with the same severe criticism.

However, from observations I have been able to make during the breeding season which has just passed, my opinion is more fully confirmed that such relation exists.

My former statements were based upon the evidence afforded by the eggs of the common sparrow—about which I shall have something to say in another paper—but the present remarks are derived from the eggs of the blackbird, which has nested very freely, and given me considerable facility for taking notes.

Nidification began about the usual period, and the eggs forming the first series of clutches were four in number, sometimes only three, but the clutches laid for the second broods generally contained five eggs. This, I suppose, was owing to the birds knowing that food would be more abundant, and they could afford to have a larger family.

The eggs varied considerably, the majority of them being of a rich colour, most certainly more highly-coloured than those of the season of 1889. The percentage of fertility was high, being 94 per cent. against 75 per cent. in the previous season; the infertile eggs were equally divided between the light- and dark-coloured eggs—the dark-coloured eggs being in the majority. This simple circumstance is a point in favour of the relationship to which the foregoing refers. The same high percentage of fertility I found maintained all through the season.

I do not pretend to answer the question why this relation should exist, except in a tentative way. The past winter was most certainly very favourable for all bird-life, the birds arriving at the breeding-season in a strong and healthy condition; therefore it may be inferred that, owing to these favourable conditions, the fertility and colour of the eggs would in all probability be favourably influenced. On the other hand, had the birds been subjected to the rigours of a severe winter, quite the opposite result would have occurred.

Ninety-four per cent. of fertility is certainly high, nevertheless the eggs of the common partridge showed the same fertility; also the eggs of the corn bunting were exceedingly fertile, in the season of 1889 they were quite the reverse. Taking the eggs of wild birds as a whole, they showed great fertility; then, on the other hand, the eggs of the common turkey were just as infertile.

In carrying out an investigation like the foregoing many difficulties have to be contended with. Pilfering collectors spoil the clutches, cats kill the sitting birds, jays and jackdaws take the eggs, then the birds will sometimes forsake their nests. However, this season the blackbirds were sufficiently numerous to allow of a disappointment now and then.

During the season just passed I met with but two irregularities in the eggs of the blackbird—i.e., one egg exceedingly small but perfect; the other sport was an egg with a very light bluish-green ground, with markings like the ring-ouzel. I believe this egg to have been infertile.

I must express a hope that this subject has occupied the attention of others interested in ornithology and oology, and that the result of their investigations may be made known to us.

JOSEPH P. NUNN.

Royston.

NOTES ON VEGETABLE TERATOLOGY.

THE amount of "material" which has reached us from kind and zealous friends since these papers commenced has been enormous. Many of the "monstrosities" are of the most instructive character. For instance, here is figured a rose, whose floral parts have not only been reconverted into leaves, but they possess their old internodal spaces also. The theory that the parts of flowers are so many modified leaves is clearly shown in "sports" like this.

The specimen figured was sent by Captain Haward, of Little Blakenham, Suffolk; but, a few days afterwards, I received an almost similar teratological specimen of a white moss-rose from Mr. F. J. George, of Chorley, Lancashire, which capitally illustrated the same fact.

But, of all the remarkable "monstrosities" it has been my experience to behold during nearly a quarter of a century's study of the subject, commend me to the remarkable thistle herewith shown. It was discovered in a field near Ipswich, by Mr. Henry Miller, president of the Ipswich Scientific Society. It is a fasciated specimen of the common thistle (*Carduus arvensis*), five feet high, and has a flattened fasciculated stem seven inches in diameter. This is crowned by a fasciated series of flower-heads, twenty-two in number, giving to it the well-known appearance of the cock's comb (*Celosia cristata*) of our gardens. The illustration is from a capital photograph by Mr. William Vick, of Ipswich (from whom photos of the object can be obtained).

Mr. W. A. Demain sent me a singular specimen of hawthorn in blossom, which mimicks in a remarkable manner the inflorescence of the sloe. He writes, as follows: "I enclose specimen of hawthorn gathered Aug. 3rd. The branch from which the specimen was cut is very near destitute of leaves, and at a distance much resembles the sloe. A short time ago Mr. James Hartley Clitheroe gathered a specimen of *Ranunculus repens*; the peduncle was an inch across, was flattened, and had five grooves, at the top we could count very distinctly six perfect flowers."

Plantago major continues to spend its floral substance in riotous living! It has gone mad this summer, and violated every botanical law of inflorescence. I have given it up as a bad job, although the multitudinous vagaries of its methods of flowering have been most instructive.

Miss Pope, of Maidstone, writes: "I have noted fasciation in dahlia (white, double), two blossom heads, one rather larger than the other, being nearly back to back, the peduncles being united to within half an inch of the bracts."

Foxgloves terminating in large, Campanulate flowers are not unfrequent. The most interesting feature about them is that the same plant will repeat the "sport" year after year. Several specimens of this teratological formation have been sent us by various friends.

Mr. J. J. Wolfe, writing from Skibbereen, co. Cork, and forwarding specimens, says: "I send you a specimen of Canterbury-bell, which may be of some interest to you—the two pieces are parts of the same stem. On the same plant are four other stems developed in the same way, and on each there were flowers with double pistils on the top as in this one—this however was the largest of the lot. I hope to

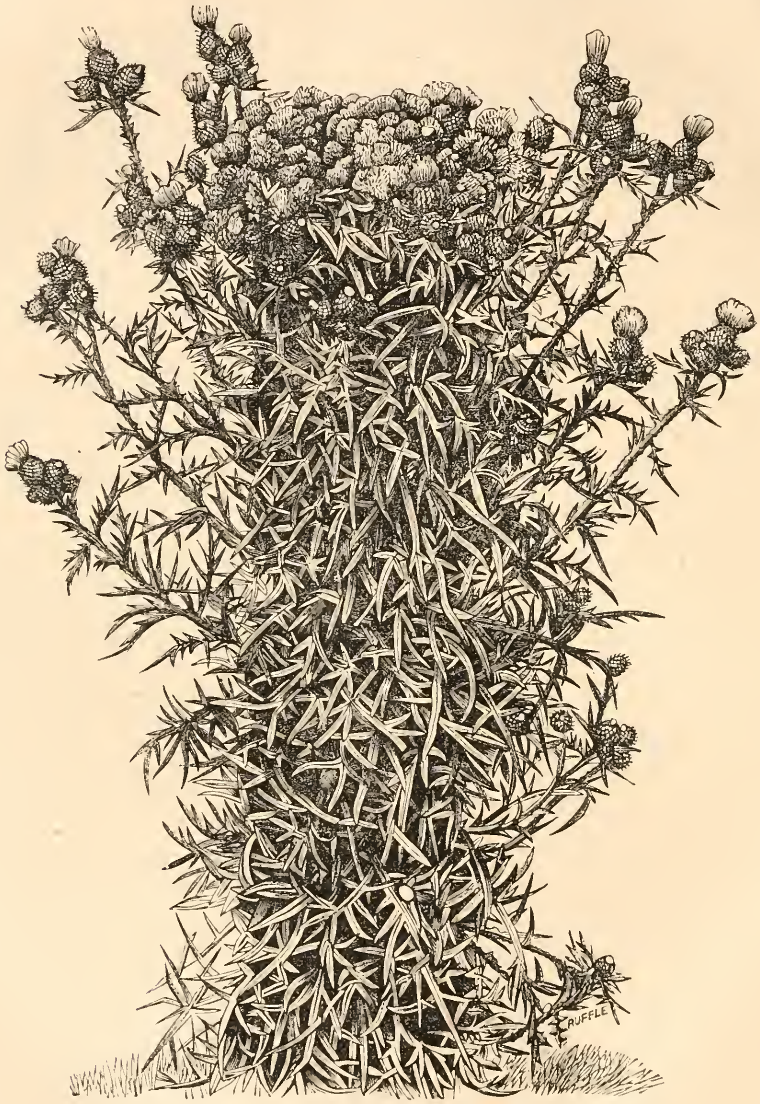


Fig. 117.—Fasciated Thistle (*C. arvensis*).

Mr. H. Blaby, of Brackley, North Hants, forwarded a specimen of sweet pea, which had assumed the rosaceous form of inflorescence. It is very remarkable that we frequently find the "monstrous" condition of the flowers of one order of plants assuming the regular and natural character of another and a nearly allied order.

Fig. 118.—Abnormal Rose.

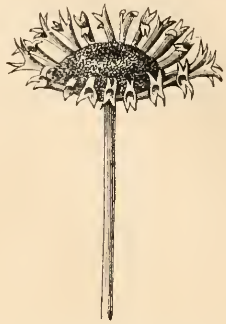


Fig. 120.—Ox-eye Daisy with tubular florets.

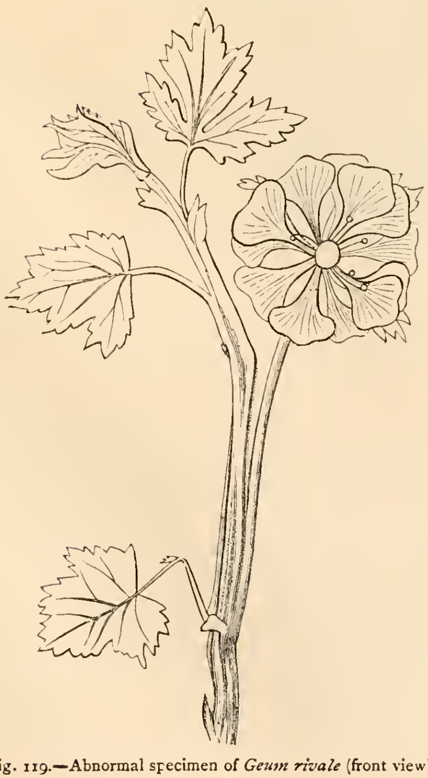


Fig. 119.—Abnormal specimen of *Geum rivale* (front view).

Fig. 121.—Abnormal specimen of *Geum rivale* (back view).

save some seed from the plant to see if the tendency is hereditary."

Miss Armitage sent me from Ross, a sketch, accompanied by the following note: "This is a specimen illustrating the vegetable teratology that you are now exemplifying in SCIENCE-GOSSIP, and if you care to use it, pray do so. It is a scape of dandelion, with two capitula closed after expansion; also there is a malformed leaf half way up the stem, and in the axil between that leaf and the peduncle is a tiny stem surmounted by two phyllaries, which seems to show that it had contemplated adding yet another flower there, but did not advance far towards it. The different specimens already presented are very interesting. I have observed many others from time to time."

Very notable is our sketch of the ox-eye daisy, showing the outer and usually strap-shaped florets converted into barren tubular florets. Some years ago I saw a common daisy with the same peculiarity. No botanist doubts that the ligulate division of the compositæ was derived from the tubulate; and these "monstrosities" are merely reversions demonstrating the law of descent. I am indebted to the Rev. D. Landsborough, of Kilmarnock, for this instructive example.

The fasciated specimen of goose-grass (*Galium aparine*) here figured is exceedingly curious. The leaves all spring from one side; the twisted appearance of the stem probably represents the phyllotaxial arrangements, modified from a square to a practically round stem.

Mr. B. C. Robinson writes as follows:—"Gathered May 7th, from among many other good specimens of *Geum rivale*. Stamens at least twenty, and styles many; petals a reddish brown with many veins; calyx composed of green leaves resembling the stem leaves in colour and texture. The number of petals is at least thirteen expanded, and others folded and about to expand. Sir J. E. Smith, in 'English Flora,' observes the *G. rivale* to have a rich purplish brown calyx, but this specimen has not, but a green-leaved one. In remarking about a hybrid *G. rivale*, he observes it is produced "by transplanting the wild roots into a dry gravelly soil, by which the flowers become red, as well as double and proliferous, with many strange changes of leaves into petals and the contrary. This variation happens not unfrequently in mountainous countries.' As it is a mountainous or very hilly country, I think I am not wrong in assuming my specimen to be one of his hybrids."

J. E. TAYLOR.

Fig. 122.—Curious fasciated specimen of Goose Grass (*Galium aparine*).

MR. STANLEY'S MEDICINE CHEST.

SOME years ago I remember being told that the medicine chest, which Mr. Stanley was taking with him to Equatorial Africa had been prepared by a very distinguished London firm; the drugs it contained, it was added, were not the ordinary fluids, but dry and compressed so as to form hard, tasteless and almost inodorous disks; an advantage which, under his circumstances, indeed under any circumstances, was simply enormous, for it saves the trouble of weighing and measuring, and all that the doctor or dispenser has to do is to count out a certain number of disks, and hand them to the patient. The importance of this improved method of dispensing is very great, and it must ultimately in large measure supersede the slower and more cumbrous methods, once the fashion in the infancy of medical science. I have found the convenience of prescribing tabloids so great that, on the rare occasions when I have had to administer medicines to any near relative, I have always given them the preference, and recently when my sister-in-law was returning to Central America and wanted to take a large supply of quinine, antipyrin, cascara, sagrada and cocaine, I obtained bottles of compressed tabloids for her, which in addition to portability and superior economy, were in such a form that she could find no difficulty in taking the precise dose required. For persons at sea and travelling, and in chronic complaints tabloids are more convenient than anything else.

Mr. Stanley in "Darkest Africa," makes the following remarks:—"Messrs. Burroughs, Wellcome & Co., of Snow Hill Buildings, London, E.C., the well-known chemists, furnished gratis nine beautiful chests replete with every medicament necessary to combat endemic disease peculiar to Africa. Every drug was in 'Tabloids' mixed with quick solvents; every compartment was well stocked with essentials for the doctor and surgeon. Nothing was omitted, and we all owe a deep debt of gratitude to these gentlemen, not only for the intrinsic value of these chests and excellent medicines, but also for the personal selection of the best that London could furnish, and the supervision of the packing, by which means we were enabled to transport them to Yambuya without damage."

It was accordingly with the liveliest curiosity that I heard that at the annual meeting of the British Medical Association in Birmingham in July, not only would Mr. Stanley be present and give an address, but that Mr. Parke, the young surgeon who had the signal honour of accompanying the Emin Pacha Relief Expedition, would receive the gold medal of the Association for Distinguished Service, while the famous chest, which has gone through such strange and eventful scenes would be exhibited. It was in some measure in consequence of the last announcement that I made my way to Birmingham intent, among other matters, on examining and reporting upon the condition in which I found the drugs which had been brought back.

It is now pretty generally known that Mr. Henry Stanley, though better, was not sufficiently recovered to be present and address the Association as was intended, though his able medical lieutenant, Mr. Parke, was present, and after receiving the medal at the hands of Dr. Wade, the president of the Association, returned thanks and made a few remarks on his memorable travels. It would be excess of flattery to say that Mr. Parke is a particularly fluent or impressive speaker, but he is an excellent surgeon, and the part he played in the expedition and the praise he received from his illustrious chief must be well known to all my readers. Mr. Stanley seems at times to have been in extreme danger, and to have run some risk of death from starvation; "he was," says Mr. Parke "nourished entirely on milk and beef-tea, peptonized by means of zymine peptonizing powders, another of the great boons of modern scientific despensing."

It is always a great privilege to see men who from accident or merit have had the rare good fortune to fill an important part, and the surgeon to the Emin Relief Expedition cannot be denied a large amount of unqualified praise, while Mr. Stanley has in graceful words done all in that way for him which any one could wish. In one of the museums I found some of the famous poisoned darts, as well as certain bullets to which, to satisfy the superstitious natives, a little wooden spike was attached; these were the property of Mr. Parke.

The chest, I was, however, particularly delighted to see, for I know to my cost, having lived on a lonely island for some years, how soon most common fluid drugs become cloudy, lose their strength, repel by their taste or appearance, and so may be in short positively injurious. I could not but hurry in anxious curiosity to the chest, which had been subjected to three years' exposure to heat, damp and rapid movement, over bad roads or rather on rough tracks in the forest.

There at last I found it, little remarkable in appearance, but henceforth memorable. I took up bottle after bottle reverently, and carefully examined the contents, and found to my surprise that in spite of such prolonged exposure they were still perfect and sound; true the contents of one or two had slightly evaporated or become enveloped in crystals, but even these were excellent, while all the other bottles were as pure, palatable and attractive as the day on which they left the works of Burroughs, Wellcome & Co. fit for another journey as long and eventful, and certain to return as good as when they started. Mr. Parke's own words deserve reproduction. "Surgeon Parke has," says the "British Medical Journal" of July 12th, 1890, "personally informed us that the concentrated preparations and tabloids retained their efficiency throughout the whole journey, and were of the utmost value by reason of their efficiency and portability,"

My readers will doubtless remember that in March, 1888, I contributed an article to this magazine on Benzoyl Sulphonic Imide, the now familiar Saccharin, in which I described the tabloids of that potent chemical product, which I had had a recent opportunity of testing and seeing made; during the past two or three years tabloids of four hundred sorts have made their appearance in the chemist's shop, and this marks a gigantic advance in scientific dispensing.

Mr. Thomas Stevens, the correspondent of the "New York World," in a lively work entitled "Scouting for Stanley," gives some bright pictures of life in the Dark Continent. Mr. Stevens was the first person to reach the famous explorer when he was returning to civilisation, and to take him news from the land of the white men. He says:—"Perfect health for the average European is not to be hoped for in Equatorial Africa. From Mombasa inland to Kilimanjaro, however, and on the elevated plains over which the author hunted and scouted for news of Stanley, one need fear nothing worse than what the pioneer settlers of America had to contend with in the way of fevers and agues. It was always something of a puzzle to Dr. Abbott and myself why a robust man should not escape sickness altogether. We lived well. Every day we disposed of a saddle of venison; ringing the changes from day to day on hartebeest, wildebeest, mpalla, zebra, waterbuck, eland, with now and then a rhinoceros roast or steak, and other variations. About once a month, however, we came in for a touch of fever. Burroughs, Wellcome & Co., the American chemists of Snow Hill, London, had kindly fitted out the expedition with a chest of their excellent tabloids. These were always immediately effective in breaking up the fever as well as in curing the many ailments of the men. One cannot speak too highly of the medicines put up in the compact form of tabloids by this firm. Their extreme portability is not the least of their recommendations to the African traveller. Stanley, in recommending these medicines in his 'Congo, and the Founding of its Free State,' has earned the gratitude of every one who goes to a tropical country. Their saccharin tabloids are especially valuable, as they have three hundred times the sweetening power of sugar."

To come to another part of the subject, Mr. Parke, in his remarks to the British Medical Association, drew pointed attention to the greater vitality and physical and mental vigour of his European companions; they were generally picked men, and so far above the average of their countrymen; at the same time they seem to have suffered little from disease and to have absolutely escaped death, except two, who were killed, while the native Africans suffered frightfully, and one third perished; they had no stamina, no capacity to resist disease and exposure; another proof that modern civilisation does not unfit men for the severest toil and the greatest risks.

My visit to the British Medical Association gathering has left many permanent impressions on my mind, amongst these the appearance of Mr. Parke, and seeing the famous medicine chest are not the least pleasant.

A QUONDAM MEDICAL EDITOR.

CONCERNING MANURES.

By F. BARKER COOKE, F.C.S., F.I.C.

PLANTS derive their carbon from the air in the form of carbonic acid gas, but all their other constituents by osmotic action from the soil in which they grow. Under favourable conditions, such as light, moisture, warmth, etc., they grow luxuriantly, produce seed, which is scattered around them, and then, if annuals or biennials, die. New plants spring from the seeds, drawing their nourishment from the soil, whilst the old ones rot on the surface, and thus return to the ground all the constituents before drawn from it. If this be allowed to go on year after year the soil will become richer and richer in plant-food, which is thus drawn from the sub-soil to be stored on the surface. But if, on the contrary, the crop, such as wheat, be yearly cut down and carried away, the soil is yearly deprived of its plant-food, and thus becomes gradually exhausted. It is, therefore, necessary to replace those substances thus abstracted, and this is done by means of manures.

But soils vary very much in composition: thus, in one field lime may be plentiful, but from another practically absent; and hence manures may be defined as any substance applied to the soil, not only to replace those absorbed by a previous crop, but also to supply any natural deficiency in the soil.

The roots of plants also materially affect the character and fertility of soils. Thus barley with very short roots obtains its food from the surface-soil and does not affect the sub-soil, whence clover with very long roots draws its supply. In the latter case the roots open the soil, and thus assist its oxidation, and further, form a fruitful source of nitrogen from their decomposition in the land after the crop has been cut. A farmer takes advantage of all this, and would grow a crop of clover before that of wheat, which has a special attraction for nitrogen. This is what is meant by the rotation of crops.

But a further circumstance must influence this, viz., that different kinds of plants do not require the same plant-food in the same proportion. Thus, according to Professor Wrightson, "turnips remove five times, beans three times, and oats twice as much potash from the soil as wheat. Oats require about five times as much lime as wheat, and barley takes twenty-six times the amount of silica from the land as an equivalent crop of wheat." If, therefore, the same crop be grown for several years in succession, the whole of certain constituents would be extracted from the soil, whilst others would remain comparatively untouched. This may be remedied by the use of manures.

By the analysis of plants we can tell what their composition is, and what elements they take from the soil for their nutrition. If a plant be dried and incinerated, the organic matters will be driven off as gas, and the mineral elements left as an ash, very small in quantity, and varying in composition for different plants. Liebig, one of the earliest of agricultural chemists, carefully analysed these ashes, and thought that by adding to the soil mineral manures containing the same elements its fertility would be restored. He, therefore, advised the use of mineral manures, and formulated the so-called mineral theory that the crops on a field diminish or increase in exact proportion to the diminution or increase of the mineral substances conveyed to it in manure; and that the ammonia in the atmosphere more than supplied the nitrogen needed by the plant. Messrs. Lawes & Gilbert, however, found that this was not so, but that the fertility of soils depended also on the presence of nitrogen from the decomposition of nitrogenous organic matter or supplied as manure. This is seen from one of their experiments: having rendered the ground on their farms at Rothamsted as uniform as possible, they divided it into plots, with which they obtained the following results:—

Kind of Manure.	Dressed Corn. Bushels per acre.
Unmanured	16
Fourteen tons farmyard manure	22
The ashes of 14 tons farmyard manure	16
Mineral manure, consisting of 350 lbs. phosphate of lime, 364 lbs. phosphate of potash	16¼
Mineral manure as above plus 65 lbs. ammonium sulphate	21

The chief constituents of manures are nitrogen, phosphorus, potash, iron, lime, magnesia, chlorine, soda, sulphur, and silica, which we will now consider more in detail.

Nitrogen is by far the most important of these, not only as one of the constituents of protoplasm, and therefore essential to plant-life, but because of its scarcity. Soils have been formed by the disintegration and oxidation of rocks, and naturally contain all, or most, of the other elements plants require; but not nitrogen, for any nitrates which may have been formed have long since been washed away, owing to their extreme solubility. Plants, too, are entirely incapable of assimilating nitrogen in a free state from the atmosphere, but only in the form of nitrates from the soil. Unless supplied by manures, the little nitrogen that is in the soil is derived from two sources:—(1) from the atmosphere in the form of ammonia, and (2) from the decomposition of organic matter, such as dead roots and leaves. The soil itself absorbs a minute quantity of ammonia from the air; but more is carried into it by rain. Messrs. Lawes & Gilbert found that in three years at Rothamsted an average of 6·1 lbs. per acre of nitrogen was carried to the soil in the form of ammonia, and 0·74 lbs. as nitric acid, making a total of 6·84 lbs. per acre. This is, however, more than counterbalanced by the loss of nitrates by drainage. The ammonia is rapidly oxidised in the soil into nitric acid, which at once combines with the surrounding bases to form nitrates. The decomposition of organic matter is chiefly effected by earthworms and bacteria. The former live on the organic matter and leave their castings, which contain about 0·35 per cent. of nitrogen, on the surface of the soil. These are broken up and spread over the fields by rain, and it has been reckoned that in one year worms bring to the surface 10 tons per acre of castings, which is equivalent to a manuring of from 70 to 80 lbs. of nitrogen per acre. The bacteria, too, live on decaying organic matter, keeping all they require for sustenance, and ejecting, among other substances, the nitrogen probably in the form of ammonia, which is rapidly oxidised into nitric acid. But bacteria will only grow in warm and moist weather, hence most nitrates are formed in summer. This action, called nitrification, takes place when nitrogenous manures are added to the soil, the nitrogenous substances being converted into nitrates. But some nitrogenous substances are more easily decomposed than others, and so act much quicker as a manure; thus a ready-formed nitrate acts quicker than ammonium-salts, and the latter than dried blood, and so on. Nitrates are very expensive, and being so very soluble that they are soon washed away, it is advisable to supply the nitrogen in another form, which will require to be decomposed in the soil before available for plant-food, and so be used by the plant on formation. Manures used for the nitrogen they contain are nitrates, ammonium-salts, farmyard manure, guanos, soot, dried blood, bones, oil-cakes, woollen rags, etc.

Phosphorus is also a constituent of protoplasm, and as phosphoric acid forms a large proportion of the ashes of plants, those of wheat and barley containing about 12, of turnips 9, and of potatoes 14 per cent., most soils contain phosphates, but only in small quantities, which render them only second in importance in manures to nitrogen. Manures containing phosphoric acid are mineral phosphates, bones, animal-charcoal, guano, farmyard manure, and oil-cakes.

Potash is necessary for the production of starch, which is the first substance formed in the leaves of plants, and is, as it were, the raw material from which the other constituents of the plant are elaborated. The ashes of plants, especially those of root-crops, consequently contain potash to a considerable degree. Thus in those of wheat there is about 17, of barley 23, of meadow-hay 25, of turnips 41, and of potatoes 45 per cent. Potash may be applied as manure in the form of potassium-salts, kainit, wood-ashes, seaweed or urine.

Iron has been found necessary for the formation of chlorophyll, the green colouring matter of plants, and hence of starch, which is only formed in those cells containing the chlorophyll granules. There is, however, already sufficient iron in the soil, and most manures contain a little.

Lime and *Magnesia* are essential to plant growth, but their functions within the plant are not thoroughly understood. The former acts physically and chemically in the soil in improving its texture, accelerating the decomposition of organic matter and silicates, and in combining with the nitric acid set free during nitrification. Indeed, it appears that this process cannot be carried on unless some salifiable base be present. The proportion of lime present in the ashes of plants varies greatly; those of wheat and barley containing about 5, of meadow-hay 16, of turnips 20, and of potatoes 15 per cent. Magnesia constitutes a very much smaller percentage. Lime manures are quick-lime, chalk, marl, super-phosphates, gypsum, building-rubbish, etc.

Chlorine has only been found essential to plant-growth in the case of buck-wheat, but most plants contain a trace. This is partly derived from the atmosphere, the average amount annually contributed by the rain at Rothamsted being 14·92 lbs. per acre, which is equivalent to 24·59 lbs. of common salt. If applied as manure it is generally in the form of common salt, but most manures contain sufficient chlorine for practical purposes.

Soda is not necessary for plant-life, and is only found in very small quantities in the ashes of plants. It probably acts chemically in the soil as a base, as in the case of lime. It may be applied as to sodium-salts, urine, soda-felspar, etc.

Sulphur is another of the constituents of protoplasm, but is seldom applied as manure, as soils contain sufficient in combination as sulphates. Rain, too, contains a trace of sulphuric acid, the average annual amount at Rothamsted being 18·5 lbs. per acre. There is more sulphur in turnips than in any other root-crop, and, therefore, super-phosphates, which contain much gypsum and often free sulphuric acid, are used to manure them.

Silica is found in the ashes of all plants, although not essential to plant-life. It occurs chiefly in the stem of most of the Graminaceæ, and often in large quantities. Thus the sugar-cane contains so much as to render the entire abstraction of sugar by pressure practically impossible, and the resulting "megass," or crushed canes, useless for fuel. The ashes of the straw of wheat, barley and oats, contain about 68, 51 and 47 per cent. respectively. Messrs. Lawes & Gilbert, however, have found that wheat can be grown entirely free from silica, and yet of as good quality. Most manures contain it, but, owing to its abundance in soils, there is no need for it to be specially added.

(*To be continued.*)

ASTRONOMY.

By John Browning, F.R.A.S.

At the last meeting of the Royal Astronomical Society, a paper by Mr. Williams was read on a coming conjunction of a remarkable dark spot on Jupiter with the red spot. The great red spot has now been closely observed for about twelve years, but very little is known of its attitude relatively to the other markings on the planet. A large dark spot has now been visible for some time on the southern belt, and this is now gaining on the red spot rapidly.

Mr. Williams considered that if the black spot remained visible and continued its motion from east to west, it would overtake and pass the red spot, and this would afford an opportunity of observing whether it passes over the red spot or if it is covered by it. He calculates that the black spot will be in conjunction with the following end of the red spot on the 29th July, with the centre on the 28th of August, and with the preceding end on the 27th of September;

Rising, Southing, and Setting of the Principal Planets, at intervals of Seven Days, for September.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	3	7 59M	1 35A	7 11A
	10	8 5M	1 26A	6 47A
	17	7 51M	1 5A	6 19A
	24	7 4M	0 26A	5 48A
Venus ♀	3	9 40M	2 45A	7 50A
	10	9 58M	2 45A	7 32A
	17	10 15M	2 45A	7 15A
	24	10 31M	2 45A	6 59A
Mars ♂	3	2 41A	6 16A	9 51A
	10	2 32A	6 6A	9 40A
	17	2 24A	5 57A	9 30A
	24	2 15A	5 49A	9 23A
Jupiter ♃	3	5 16A	9 31A	1 51M
	10	4 48A	9 2A	1 20M
	17	4 19A	8 33A	0 51M
	24	3 52A	8 5A	0 22M
Saturn ♄	3	4 54M	11 50M	6 46A
	10	4 32M	11 26M	6 20A
	17	4 9M	11 1M	5 53A
	24	3 46M	10 37M	5 28A

thus taking about two months to pass either under or over the red spot.

Commander Defforges gave an account of a long series of pendulum experiments he had made for determining the figure of the earth, which he said is unfortunately by no means the regular spheroid it is frequently assumed to be.

From the United States Naval Observatory, Washington, I have received a copy of the third edition of a Catalogue of Stars that were observed between 1845 and 1877. This is a most valuable catalogue; every possible precaution has been taken to ensure the utmost accuracy. The matter was prepared for publication by Professor Yarnell, and revised and corrected by Professor Frisby.

On September 18th Venus will be at the greatest distance from the Sun.

There are no occultations or other phenomena of popular interest in September.

Mercury is an evening star in the early part of the month in Virgo.

Venus is an evening star in Virgo.

Mars is an evening star.

Saturn is a morning star.

GEOLOGICAL RAMBLES IN CROMARTY AND NEIGHBOURHOOD.

By Charles Wardingley.

It is surprising that, during the holiday season, when travelling facilities are so greatly increased, so few take advantage of them for the purpose of visiting the intensely interesting neighbourhood of Cromarty. However, some do take the opportunity, and, whether attracted by the varied natural beauty of the district, the botanical and geological treasures to be found there, or by the interest attached to the birthplace and early abode of Hugh Miller, the visit is sure to be rewarded by increased knowledge and considerable pleasure.

At present our purpose is to give a brief sketch of the neighbourhood from a geologist's view, firmly convinced as we are that there is no finer district in Britain for the study of the Metamorphic, Palæozoic, and Mesozoic rocks. Hugh Miller has described these in popular, even poetic language, and if geology were not a progressive science, any attempt at further description would probably meet with but limited success.

But the impetus which he gave to geological research has been very effective, and many new facts have been brought to light by those who, attracted by his words and works, have plied hammer and chisel to disinter the varied remains of past periods.

The visitor who approaches Cromarty by steamer will probably have his admiration and enthusiasm aroused the moment he enters the Firth of Cromarty To the right and left of him rise the Sutors; high, majestic Gneiss cliffs, varying in height from three hundred to four hundred and fifty feet. Then, a little to the west of the southern Sutor, Cromarty peeps out close to the shore, having for its background the richly-wooded Hill of Cromarty. Immediately behind the town and on the slope of the hill, stands out prominently and effectively the statue of the remarkable man whose name is indelibly associated with the town of Cromarty.

> "Love had he found in huts where poor men lie;
> His daily teachers had been woods and rills."

The first visit will probably be to the cottage in which Hugh Miller was born. This cottage is used partly as a dwelling-house, the occupant having known intimately the various members of the Miller family. She is, though communicative, not of the type usually found in such posts, and one feels that she takes a more than commonplace, or shall we say commercial interest in the life and memory of the man whose neighbour she was for many years. The upper storey of the house is used as a museum, which, though ill-arranged and very incomplete, contains many objects of general and special interest. The embryo geologist's school-books, his early poetical effusions, some local fossils, volumes of the *Witness* newspaper, and letters from Agassiz, Hibbert, Fleming, Murchison, Robert Dick and others, all have their story to tell of the plodding and pains-taking nature of the man. We leave the house feeling that we have a clearer insight into his make and manner, and we feel, too, less surprised that such a character should have such an influence for good, not only upon the youth of his native town, but upon the rising generation of the entire kingdom. For the geologist, on his first visit, no better guide-book to the neighbourhood can be had than "My Schools and Schoolmasters," and we would recommend that the geological chapters be carefully and thoughtfully read, before excursions are commenced.

Let us describe the rocks of the various formations as they occur in order of time, beginning with the Primary representatives. These are best observed and studied in the Sutors and the Hill of Cromarty, and as the one is typical of the others, an examination of the hill (the most accessible) will suffice. It is built up entirely of coarsely-grained Gneiss, having as its chief constituting minerals felspar, mica, and quartz, with a minor proportion of hornblende and steatite. The felspathic element, however, prevails, and the following may be taken as a rough analysis of the entire mass:—

Silica	65·0
Alumina	15·0
Potash	10·0
Magnesia	2·2
Oxide of Iron	2·8
Various	5·0
	100·0

The rock shows but little evidence of stratification, and is occasionally scarcely distinguishable from coarse granite. In colour it is a bright brick red, intermingled here and there with white quartz. Few distinct crystals of any of the constituent minerals can be obtained, and of these the majority are mica crystals in the rhombohedral form. Garnets occur frequently in the mica, though lacking the perfect form so frequently exhibited in the later schists.

If a ramble to the southern Sutor be made, the student will be rewarded by splendid exposures, and by a lessson on the Gneiss rocks which will amply repay him for his trouble. He must however, be prepared for rough climbing, while a firm foot and a steady nerve are perfect necessities for this somewhat hazardous journey. He must be careful also to choose his time well, so as to reach the Cromarty side of the cliff before low water. He may then spend two or three hours examining the rocks, the cliff at the base being fairly accessible, but soon after the tide has turned he must, in order to avoid any disagreeable consequences, proceed as quickly as possible to the eastern extremity or retrace his steps. Failing this he may find himself perched on some rock from which he cannot proceed upwards, and from which he dare not descend.

The beach on both sides of Cromarty is literally paved with schists of various kinds, which have been rounded and thrown on to the shore. An inspection of these will give the student a good idea of the composition of the Primary rocks in and contiguous to the Firth of Cromarty.

The Old Red Sandstone deposits of Cromarty are sure to be examined with double interest by any geologist who visits the place. These are well exposed on both sides of Cromarty, and within a mile from the town. They comprise some of the lowest beds of the formation, being as it were, the very foundation of the system. The exposures of the Cromarty Firth side of the town consist of dark red rocks, very friable, and coarse in texture. They are unfossiliferous, and consequently need little description. On the Moray Firth side of the town a higher bed occurs, but it is not accessible except at very low water. When circumstances are favourable a really pleasant and interesting time may be spent, and fairly good specimens of the various fossil ganoid fishes may be obtained. The remains are enclosed in limestone nodules which emit the usual odour on being struck by the hammer. A large number of these nodules may be collected from the rusty coloured matrix of sandstone in a short time, and most will be found to contain some specimen of fossil-fish more or less perfect. Amongst the specimens so likely to be found we mention the following as characteristic :—*Diplacanthus striatus*, *Dipterus macrolepidotus*, *Coccosteus decipiens* and *cuspidatus*, *Climatius scutiger*, *Cephalaspis* (sp.), *Pterichthys Milleri*, *oblongus*, and *latus*, *Glyptolepis leptopterus*, *Cheirolepis Traillі*, *Asterolepis* (sp.).

The Dipterus, Pterichthys, Diplacanthus, and Asterolepis specimens are usually fairly good, while of the others probably only detached scales and plates will be got. Much of the information we have concerning these early ganoids is due to the enthusiasm and patient energy of Dr. R. H. Traquair, Edin., who is probably the best living authority on the Palæontology of Fishes. No shell remains are found in these beds, but not unfrequently imperfect impressions of Fucoids (Zosterites, etc.,) may be brought to light. After a very severe storm or an exceptionally high tide, this particular spot, about mid-way, between the town and the southern Sutor is strewn with the nodules containing the above remains, and the geologist who happens to be staying in the district at such a time will do well to take advantage of such an opportunity for adding to and enriching his cabinets.

The Liassic formation is represented at and near Cromarty by some of its upper beds. Those at Cromarty lie under the water just beyond, and east of the quay, but occasionally the limestone nodules and other rock specimens containing organic remains are dislodged by the water and thrown on to the shore. The best localities in the neighbourhood for the study of the formation are Eathie shore (three miles from Cromarty ,on the Fortrose road), and between Shandwick and Barachie on the coast of Easter Ross, about six miles north-east of Nigg Ferry. At Eathie the upper lias is exposed partly in nodulous limestone, and partly in a series of laminiferous beds. The nodules contain the best fossils, though, as usual, they are very difficult to extract. The perfect specimens when obtained are exceedingly beautiful. *Ammonites biplex* and *ornatus* occur, varying in size from half an inch to five inches in diameter; *Belemnites abbreviatus*, *spicularis*, and *obeliscus*, may be obtained (usually broken) in the shaly beds. These latter also contain thousands of Ammonites, generally crushed beyond identification. Lignite is very common in the limestones, and occasionally small scales, teeth and jaws of fish may be observed side by side with small specimens of Pecten, Gryphæa, etc.

The rambler will readily find the fossiliferous bands if he keeps the main road between Cromarty and Fortrose, only descending on to the shore (by a circuitous path branching off to the left) after he has reached the very summit of Eathie Hill.

At Shandwick the Middle Lias is exposed, and good fossils may be got by thoroughly and carefully examining the small promontory locally known as "West Point." The varieties do not appear to be numerous, and probably the most characteristic are *A. perarmatus*, *B. canaliculatus*, *Rhynconella lineata* and *Gryphæa incurva*.

There are other places of geological interest which might be mentioned, but for the ordinary holiday tourist those already described will probably suffice.

SCIENCE-GOSSIP.

THE Rev. H. W. Lett sends us his "Report on the Mosses, Hepatics, and Lichens of the Mourne Mountain District," a paper read before the Royal Irish Academy.

DR. G. J. HINDE'S paper, "Notes on Radiolaria from the Lower Palæozoic Rocks (Llandeilo-Carader) of the South of Scotland," which appeared in the "Annals and Magazine of Natural History" for July, has been reprinted.

THE May number of the "Proceedings of the Geologists' Association" contains an article by Mr. T. V. Holmes, entitled "Notes on the Nature of the Geological Record."

MR. E. WILSON sends us his well-written "Guide to the Bristol Museum," of which he is the able Curator.

IN the last number of the "Annals and Magazine of Natural History," Mr. J. Wood-Mason, Superintendent of the Indian Museum, describes a viviparous caddis-fly.

THE same number contains a "List of Land and Freshwater Shells collected by Dr. Emin Pasha in Central Africa, with Description of New Species," by Edgar A. Smith.

WE have received No. 4 of Mr. Wallace's useful text-book of "British Cage Birds," published by L. Upcott-Gill.

GOOD work in the protection of plants has been done by L'Association pour la Protection des Plantes, founded at Geneva, in 1883, No. 8 of whose Bulletins is before us. It is well printed and illustrated, and is full of interesting matter.

DR. J. C. BROWN, LL.D., sends us his brochures on "The Pine Trees of Europe," "Modern Forest Science," and "African Fever and Culture of the Blue Gum-tree to counteract Malaria in Italy." They are all well worth reading.

ZOOLOGY.

THE FOOD OF THE BIRDS.—In his paper in the July number under this title, Mr. C. Parkinson invites the experiences of others. My observations—also made in Worcestershire—lead me, in one or two cases, to very different conclusions. To take the cases I refer to according to the numbers given in his paper. V. The black-cap and garden warblers, also the greater white-throat, levy very heavy toll on the currants and raspberries. VII. The hawfinch makes terrible havoc among the green peas. A labourer brought me one of a whole family which he shot last year on his row of peas, that I might tell him what it was, and asking if it was not "one of the parrot tribe," and saying that it was a shame to bring such foreign birds and turn them up in England. XIII. I have known the rook to show a great partiality for green walnuts, and he is a good hand at digging up potatoes. XV. What Mr. Parkinson says of greenfinches and radish beds, according to my experience, applies with ten-fold force to the chaffinch. XVI. The jay is most destructive to raspberries, cherries, and peas. Of course I do not mean to imply that these birds do no good. On the contrary, with the exception of the hawfinch (a bird that I grieve to see destroyed), I believe that the good they do very much outweighs the harm. At the same time I think that it is quite possible to have just a few too many blackbirds in one's garden in the fruit season. I cannot say that I should like to see a law for the protection of birds' eggs generally, but I think that the sooner a close time for plovers' eggs is established, the better it will be. If none were allowed to be taken after the 15th of April, it would go a long way towards remedying the diminution of these useful birds of which the farmers so justly complain.—*K. A. Deakin.*

PRESERVING SPIDERS.—Will any of your correspondents kindly inform me, or would you please refer me to any published works or papers on the subjects of (1), the best way to preserve spiders for exhibition or reference, and (2), to prepare for preservation the larvæ of lepidoptera?—*W. G. Clements.*

BOTANY.

DEATH OF MR. JOHN RALFS.—We regret to announce the death at Penzance on the 14th of July, of Mr. John Ralfs, the eminent botanist, at the advanced age of 83 years. Forty years ago he was one of our leading algologists, and his researches among the lower forms of vegetable life led to the publication of his beautiful monograph of the British Desmids, a work which, of its kind, has never been surpassed. Ralfs also wrote the diatom portion of Pritchard's Infusoria (last edition), and contributed from time to time papers to several of the learned societies. He was by profession a surgeon, but early in his career was compelled to relinquish his practice owing to ill-health.

THE FLORA OF GUERNSEY.—Notes upon the Flora of Guernsey appeared in your May number, contributed by Mr. E. D. Marquand, who enumerates, first, the rare British plants which are indigenous to Guernsey; and then such plants as are peculiar to the Channel Islands. I find no mention made in either group of a very pretty yellow mimulus which was growing abundantly in a moist locality in 1885. I looked through the Botanical works in the public library, but could find no notice of it. Some of the plants were sixteen or eighteen inches high: it was in appearance not unlike a very large *M. moschatus*, with downy leaves and stems and upright growth. If I mention the place in which it grows it will probably be exterminated by this time next year, so I shall privately communicate with Mr. Marquand, who will, I hope, favour us with an accurate description of it.—*Norris F. Davey*, *Abergavenny*.

Marine Hunting-ground.—May I venture to call the attention of readers to an excellent hunting-ground for seaweeds, viz. Peveral Point, at Swanage. I have not seen it mentioned in any of the works on seaweed which I have come across, and it may therefore be new to some collectors.—*A. H. B.*

Lemna Minor.—I observed to-day *Lemna minor* in flower; it was growing in a small pond mixed with barren fronds of *L. trisulca*, the plants were floating, the pond being nearly full. With the naked eye I distinguished the stamens perfectly, one plant had two, and I think I have seen the style. I have not time at present to examine the plant thoroughly.—*M. S. Pope*, *Maidstone*.

GEOLOGY, &c.

Ichthyosaurus at Watchet.—With reference to Mr. T. Stock's interesting note on the discovery of Ichthyosaurus in the Lower Lias, near Watchet, it may be remarked that there is a fine example of the pectoral arch from that formation and locality in the museum of Boulogne-sur-Mer. The specimen is described by Dr. H. E. Sauvage, without specific name, in the Bulletin of the French Geological Society, ser. 3, vol. xv. (1887), p. 726, pl. xxvi.—*A. S. W.*

Dryopithecus.—Until lately it has been considered that Dryopithecus was more nearly allied to the human species than any ape now living. The reason for this supposition was that the best specimen known was very imperfect, and showed but a small symphysis. However, Professor A. Gaudry has recently shown from a more perfect specimen of the lower jaw, showing a long symphysis, that Dryopithecus is really the most generalised of all the anthropoid apes.

The Teignmouth Pebbles.—Our conglomerate rocks and pebbles are full of corals, spongy forms, and various mineral rocks. Whence do they come?—Visitors who wander season after season on the lovely shores of Teignmouth and Shaldon, collecting pebbles, often wonder whence they come. Having read much with a view to the solution of the enigma and still pursuing the subject, I have arrived at some reasonable and satisfactory theory respecting the source whence came these attractive productions of nature. The Teignmouth pebbles for nearly a century have lent adornments to many a fair lady of the Isle of Great Britain. Visitors who ramble along our shores to the Parson and Clerk Rocks, and again around the Ness Rocks, on the Shaldon side by crossing in the ferry-boat at the mouth of the "Teign," will still find the very peculiar red conglomerate rocks, and around Teignmouth, just a few miles apart, those rich quarries of marble and madrepore corals. In looking at those rocks and quarries, I have felt convinced that some wonderful convulsion must have taken place here in the remote ages. The observer will notice that the rocks have the appearance of being lifted up, shattered and overturned in some places, but it is only the geologist who knows the vast extent of this disturbance. He never finds crystalline, non-fossiliferous rocks which have not been more or less removed from their original position, and usually he finds them to have been thrown up by some powerful agency into almost every possible position. Those wonderful convulsions of nature have brought to light the useful metals, coal, rock-salt, marble, gypsum, and other useful minerals, and when we consider how necessary these substances are to civilised society, who will doubt that it was a striking act of benevolence which thus introduced disturbance, dislocation, and apparent ruin into the earth's crust. Most of the sublime and the beautiful in the scenery of a country depends upon this disturbing agency. Beautiful as vegetable nature is, how tame is a landscape, where only a dead level is covered with it and no swelling hills or jutting rock, or murmuring waters to relieve the monotonous scene; and how does this interest increase with the wildness and ruggedness of the surface, and reach its maximum only where the disturbance and dislocation have been most violent. Surely natural scenery does afford to the unsophisticated soul one of the richest enjoyments to be found on earth.—*A. J. R. Sclater*, *M.C.S.*, *Teignmouth*.

NOTES AND QUERIES.

Monstrous Foxgloves.—Observing a number of stems of the foxglove growing too closely, from seed which must have been lying in the ground several years, I thinned them out to two, which were then very near together. When about two feet high each stem bore a flower at its apex, which, when fully developed, was bell-shaped, three inches in diameter, and opening vertically upwards. Each corolla was eighteen lobed, and enclosed twenty stamens, or, to be quite correct, one of them had nineteen stamens and one small petal. There were the usual markings, but in place of the pistil there appeared a number of green buds. By this time, however, the lower portions of the stems began to flower in the orthodox fashion, and the abnormal flowers gradually faded. I may add that each stem produced a number of branches, nearly all of which developed first a large flower at the apex, opening like the first, vertically upwards, catching the drops of rain till nearly full of rain-water. They were not, however, bell-shaped, and only contained from six to eight stamens, their size being in proportion to that of the branch on which they grew. Being called away for some weeks to another part of the country, to my very great regret, I found, on my return, the greater part of the stems removed by the amateur gardener, and was only able to secure a few seeds from the latest flowers.—*J. Wallis, Deal.*

TENACITY OF LIFE.—In reference to a note by Mr. Bedwell in the July number, page 166, on "Tenacity of Life in a Cat," it is well known that lacerated wounds, such as that inflicted on the cat, do not bleed. It sometimes happens in machinery-accidents that the human arm is torn off at the shoulder without a drop of blood being lost. There was also a case recorded in the "British Medical Journal," some two or three years ago, in which a boy's leg was torn off at the knee without any serious hæmorrhage, the boy making a good recovery. In these cases the inner coat of the artery curls up, and the middle or muscular coat contracts strongly, so as to occlude the vessel.—*A. W. Harrison, M.R.C.S., House-Surgeon, Westminster Hospital, S.W.*

HUGE MOTHS.—Some time ago I was staying with a friend at a place called Ramgarh, in the district of Gorahkpur, N.W. Provinces, India. It was, as well as I remember, about the end of July, or the beginning of August. The place is situated in the midst of the forests. One evening, about nightfall, I was out for a walk, and on my return, in a very dark place, I heard a strange clicking noise, I went over to where the sound seemed to come from, and although I could see nothing, the sound appeared to come from things flying about, at some four feet from the ground. As I could see nothing, I lay down on the ground, so as to get the sky as a background, and then saw that the noise was caused by either largish moths, or very small bats. The following evening, at about the same time, I was passing by the same place, and I heard the same noise. I went over, and, of course, saw nothing. However, I was wearing a stiff pith hat, and with that I struck in the direction of the sound, and, after a couple of misses, I heard by the thud that I had struck something, and at the same time the clicking stopped. I thought I had knocked something down, but I could not see anything. However I felt about on the ground, and after a while I found a dead moth, which I brought home. On the way I heard the clicking in several places, so that I knew that even if I had killed one there were plenty more. The next evening I took a butterfly-net with me, and in the same way, by striking in the direction of the sound, I succeeded in catching another, which I brought home alive. Subsequently I caught several others, but always by sound and not by sight. The moth was about 2 in. 9 lines across the wings, and had broad wings, so that it was either a bombyx or a geometer. The body was slightly stouter than that of *V. Atalanta*, the under-side of the wings was a blackish-brown, and the upper side was also a dark blackish-brown with a velvety gloss. The only marks were small yellowish spots, one on the costa of each fore-wing. The cause of the clicking appeared to be two stiff bristles about two-thirds of an inch long, which projected, one on each side, between the roots of the wings. The noise seemed to be caused by these striking against the costa of the hind-wings, although if that were so, I would have expected to find the wings somewhat torn, which was not the case. I allowed the ones which I brought home alive to fly about the lamp, and they sometimes clicked, and sometimes did not. As far as I could form an opinion, the noise was made when flying steadily, and not when fluttering. It could be fairly well imitated by clicking the thumb- and finger-nails together, and apparently imitating the noise attracted the moths. I suppose the species is well-known, but I should like to know the name.—*J. R. Holt.*

NATURAL HISTORY NOTES.

White beet seen in Arboe school-house, 1889, co. Tyrone. Piebald fieldfare seen in Ardhea parish, co. Tyrone, 1889. A tumbler-pigeon hatched out a Minorca chicken, a hen having laid in the pigeon-box.—*Arboe Rectory*, 1890.

A hen was observed going down the chimney of a cottage in Arboe parish. The owner was asked how it came to do this; he said the house was often locked up when he was at work, and this particular hen discovered this strange way of ingress.

A hen sitting on eggs in an outhouse at Cushendun, where there was a small hole in the roof, just above her nest, moved her nest and eggs to one side to prevent the rain falling on her.

A goose made her nest and laid on the top of a thatched cottage in Glendun, co. Antrim. She pulled away the thatch off the rigging of the roof, and sat there during the time of incubation—she had to fly up and down.

On July 12th the thermometer at Cushendun stood at 31° during the night. Several nights it was 33½° Max. Ther.; 74½° on the 26th.

May 22nd.—The aurora was very bright after sunset, rose-coloured. The reflection gave the river a rose-coloured tint.—*Rev. S. A. Brenan, Cushendun, co. Antrim.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

A. H. B.—You could hardly do better than procure a copy of the "Manual of British Seaweeds," published by Routledge & Warne, price 7*s*. 6*d*.

"SPONGE."—A good way to clean a toilet sponge is to boil it repeatedly in rain-water, to which a spoonful of vinegar has been added.

F. H. ARNOLD.—See the figure of the Monstrous Foxglove in the May number of this year's SCIENCE-GOSSIP. The "white lily growing out of a foxglove" the lady spoke of, was undoubtedly a malformed white foxglove.

J. ANDERSON, JUN.—The rosette-like leaves of willow are caused by suppression of the internodal spaces, probably due to the attacks of aphides or other insects.

DR. A. M. (Market Drayton).—The growth on leaf of birch is said to be due either to aphides or gall insects.

ALFRED SICH and GEO. MACLACHAN.—Many thanks for your interesting teratological specimens.

"PEBBLE RIDGE." — See a paper in the "Gardener's Chronicle" three or four weeks ago on the peculiarity of the laburnum you mention and its cause.

W. BRANFORD.—By some means the insects referred to in your letter did not reach us. Can you send us more for identification?

A. S. BERTOLET (Cummings, Illinois).—Apply to Messrs. Wesley & Son, Essex Street, Strand, London, or to W. P. Collins, 157 Great Portland Street, London, W., for first or secondhand copy of Kerner's "Flowers and their Unbidden Guests." Perhaps some of our subscribers would exchange copy with you.

M. L. M.—From your description the object was a species of freshwater algæ, possibly a desmid or volvox. Get Dr. M. C. Cooke's recently published "Freshwater Algæ," price 5s., published by Kegan Paul; or the 1s. copy of "Young Collector's Series" on "Freshwater Algæ."

EXCHANGES.

A GREAT number of fossils from red crag, Paris basin, and other formations (mostly named and labelled), in exchange for works on North American geology,or cash.—P. Tracy, 9 Lower Brook Street, Ipswich.

ONE hundred British land shells, fresh collected, various kinds, offered in exchange for good specimens of birds' eggs—greater blackback, gull, red grouse, golden plover, one of each.—H. Blaby, Brackley, Northants.

WANTED, SCIENCE-GOSSIP for 1877, and "Midland Naturalist" for 1888 and 1889, bound or unbound; will give good microscopic slides in exchange.—J. Collins, 147 Muntz Street, Birmingham.

SEVERAL specimens of *Eurylepsis minimus*, Newb., small entire fishes from coal measures, Ohio, offered for other good fossils.—T. Stock, 16 Glen Park, Eastville, Bristol.

WILL exchange British and Continental land and freshwater shells, also marine shells and British butterflies, for mosses, lichens, hepaticæ, and other shells not in collection. For lists apply to—H. B. Preston, jun., 54 Lexham Gardens, Kensington, W.

WANTED, Lee's "Microtomist's Vade Mecum," in good condition. Will give "Evenings at the Microscope," by Gosse; White's "Elementary Microscopic Manipulation," and micro-slides illustrating pond life.—A. Montague, Penton, Crediton.

GOOD exchange given for fine living specimens of the common garden spider (*Epeira diadema*).—John Rhodes, Blackburn Road, Accrington.

OFFERED, "Avifauna of British India," by James A. Murray, complete in seven parts (unbound), with numerous coloured plates and woodcuts. The above is a new work, completed only this year, and the copy is in good condition. Wanted, recent zoological (especially entomological), microscopical or botanical works, or other offers.—E. E. Green, Mote Hall, Bearsted, Maidstone.

WANTED, animal and vegetable hairs, also feathers, in exchange for micro seeds or young cactus plants.—J. T. Holder, 18 Casella Road, Hatcham, S.E.

Vertigo pusilla, &c., offered for *Succinea oblonga*, or foreign land and freshwater shells (African or Asiatic preferred).—W. Hy. Heathcote, M.C.S., Preston, Lancs.

OFFERED, *P. roseum*, *P. fontinale*, *V. cineria*, *S. elegans*, var. *octachea*, *L. palustris*, *M. decollatum*, *S. corneum*, var. *nucleus*, *H. aspersa*, var. *flammea*, *B. acutus* and *V. strigata* (Cheshire). Wanted, the rarer British land and freshwater shells, and many varieties. Foreign correspondence wanted.—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

WANTED, other rare and perfect shells in return for the following:—*Scalaria clathratula*, *Eulima polita*, *E. distorta*, *E. bilineata*, *Pleurobranchus membranacea*, *Mytilus edulis*, var. *pallida*, *Ianthina Brittanica*, *Hydrobia similis*, *H. ventrosa*, *Cerithium perversum*, *Cerithiopsis tubercularis*, *Odostomia rissoides*, *O. nivosa*, *O. interstincta*, *Pandora inæquivalvis*, *Pholas dactylus*, *P. parva*, *P. candida*, *Cyclostrema cutlerianum*, *Barleeia rubra*, *Lasæ rubra*, *Rissoa fulgida*, *R. parva*, *R. senustriata*, *R. punctura*, *Trochus magus*, &c. —What offers in British shells or mounted rock sections?—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

RARE British marine shells, land and freshwater shells, polished thin sections of corals and spongy forms, polished geological cabinet specimens, fossils. Wanted, a secondhand watch to give to a lad. Will any one oblige me with one in exchange for any of the above?—Thomas E. Sclater, Bank Street, Teignmouth.

BARTON, Headon, and other fossils offered in exchange for any not in collection.—Thomas Reader, 171 Hemingford Road, London, N.

WANTED, any or all of the following:—SCIENCE-GOSSIP, Nos. 52, 59, 60, 68–70, and 89. Offered, a complete volume of the "Midland Naturalist," other numbers of SCIENCE-GOSSIP, or micro-slides. Also wanted, Le Mavut and Decaisne's "General System of Botany."—F. C. King, 35 Addison Road, Preston, Lancs.

WANTED, foreign shells and butterflies, in exchange for choice microscopic slides, anatomical, diatoms, parasites, double-stained botanical, &c.—R. Suter, 5 Highweek Road, Tottenham, London.

MOSSES.—Wanted (London Catalogue), Nos. 460, 465, 470, 472, 473, 484, 488, 491, 498, 499, 507, 508, 510, 511, 518, 527, 530, 533. Offered, 492, 502, 503, 505, 520–24, 528, 531, 532, 539, 540, 542, 545, 547, 552, and several others.—W. P. Hamilton, Shrewsbury.

Bulimus oblongus, four inches long, *B. pulchellus* (from Brazil), living animals. What offers?—G. K. Gude, 5 Giesback Road, Upper Holloway, N.

NAMED and localized Barton clay and Headon Hill fossils, also deposit from both places containing thousands of small shells, bryozoa, &c. Wanted 1½-inch objective, perfect terebratulæ from other formations, also small induction coil, electric bells, or any electrical material or books.—E. H. V. D., San Remo, Darracott Road, Boscombe Park, Bournemonth.

OFFERED, a splendid table stereoscope, good as new, to hold 100 views or 50 transparencies, with two sets of lenses. Wanted, a half-plate roller-slide (Eastman's), latest pattern.—A. H. Burnand, High Street, Poole, Dorset.

WANTED, a good objective for microscope, or accessories, in exchange for Italian classics, &c.—Joseph Wallis, Deal.

SIDE-BLOWN eggs, capercaillie, snipe, herons, cuckoos, and many others, in exchange for common British eggs, books, barometer, or objects.—Jas. Ellison, Steeton, Keighley.

OFFERED, rocks and fossils from most formations. Wanted, fossils, rocks, and rock sections. Lists exchanged.—S. H. Reynolds, Southoven, West Worthing.

WANTED, minerals of any kind, in exchange for stuffed birds, fencing gear, books, &c.—W. J. Weston, jun., Beckley, Sussex.

DARWIN'S "Origin of Species," Carlyle's "Letters and Speeches of Cromwell," and "The French Revolution," in splendid condition. Wanted, a good text-book in zoology, or good book on microscopy.—W. H. Thresh, 76 Clifton Street, Lytham.

WANTED, named vars. of *Helix aspersa*, *H. nemoralis*, *H. hortensis*, also *H. fusca*, *H. revelata*, and *Acme lineata*. Will give other land and freshwater shells, and birds' eggs.—T. H. Hedworth, Dunston, Gateshead.

BOOKS, ETC., RECEIVED.

"Diseases of Crops and their Remedies," by Dr. A. B. Griffiths (London: Geo. Bell & Sons).—"Wild Nature Won by Kindness," by Mrs. Brightwen (London: T. Fisher-Unwin).—"Report on the Mosses, Hepatics, and Lichens of the Mourne Mountain District," by Rev. H. W. Lett.—"Sunburn on the Alps," by R. L. Bowles, M.D.—"Proceedings of the Liverpool Geological Society."—"The Preservation of Local Fauna and Flora and Objects of Archæological Interest," by J. R. B. Masefield, M.A.—"Report on the Progress and Condition of the Botanic Garden, Adelaide, S. Australia."—"Half-Hours by the Seaside," by Dr. J. E. Taylor (new edition) (London: W. H. Allen & Co.).—"Journal of Conchology."—"Nature Notes."—"Bulletin de l'Association pour la Protection des Plantes," Nos. 1 and 8.—"Journal of Quekett Microscopical Society."—"American Naturalist."—"The Pine Trees of Europe."—"Modern Forest Science," and "African Fever and Culture of the Blue Gum-Tree to Counteract Malaria in Italy," by J. C. Brown, LL.D.—"Guide to the Bristol Museum," by E. Wilson, curator.—"Canadian Entomologist."—"Insect Life."—"Reports of Observations and Experiments in the Practical Work of the Division of Entomology of the U.S. Department of Agriculture."—"Entomologist's Monthly Magazine."—"Knowledge."—"American Naturalist."—"Canary Book."—"British Cage Birds."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Book Chat," &c., &c.

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

THE COLOURS OF ANIMALS.*

THE beautiful and varied colours exhibited by animals and plants have from the earliest times excited the admiration, and stimulated the curiosity of mankind. Whether they have been explained as destined chiefly to please the human eye, or as of some use in the economy of the organism possessing them, they have been a never-failing source of interest to the naturalist. The more or less general acceptance of Mr. Darwin's views on the origin of species led to a revolution in our method of regarding organic nature; and the problem, how the various wonderful colours of plants and animals are to be explained, from the point of view of natural selection, has ever since been one of the most fascinating of the many interesting problems before the biologist. A great deal of work has already been done in this field, and the colours of flowers, the very brilliant (not to say glaring) colours of many insects, as well as the more sombre hues of many animals of all classes have in turn been explained on Darwinian principles: while Mr. Darwin himself in his famous theory of sexual selection has attempted to account for the brilliant, varied, and most beautiful colours so often connected with the period of courtship.

In Mr. Poulton's recently published work on this subject, the author has given us an extremely able and interesting summary of our present knowledge of the colours of animals. His frank and sturdy Darwinism makes his book a great contrast to one or two recent volumes in the same series. His position is best shown in his own words: "I fully believe that further knowledge will prove that this principle (natural selection) explains the origin of all appearances, except those which are due to the subordinate principle of sexual selection, and a few comparatively unimportant instances which are due to isolation or to correlation of growth." * From this point of view no better man of science could have been found to write the present volume. Mr. Poulton is an able biologist, an enthusiastic naturalist, and one of the leaders of the Neo-Darwinian School in England; while it is superfluous to remind any one interested in the subject of his own important experiments on the colours of insects, especially on the variable protective colouration of lepidopterous larvæ and pupæ.

The book opens with a clear account of the physical cause of animal colours, which is summed up in the following words: "All these causes of animal colours may be conveniently grouped under two heads; (1) pigmentary, and (2) structural. The first head includes colours caused by absorption, and the effects produced vary with the chemical nature of the substance (pigment). The second head includes the colours or appearances produced in all other ways, the efficient cause being the structure of the substance rather than its chemical nature." †

After pointing out that all colours must have been originally non-significant, thus forming the material out of which various selective agencies have produced the colours with a meaning, and citing cases of non-significant colour, Mr. Poulton goes on to discuss cases in which colour may be of direct physiological value to the organism, that is, take part in some vital function. This must be distinguished from what is now usually called the "biological" value of colour, which gives the organism some advantage in its relations with other species. The green colour of chlorophyll is a well-known instance of the former; but "no equally clear instance has been proved to occur in the animal kingdom." Mr. Poulton, however, discusses Lord Walsingham's interesting

* "The Colours of Animals, their Meaning and Use: especially considered in the case of Insects." By E. B. Poulton, F.R.S. (Inter. Scient. Series).

* Preface, page viii. † Page 11.

suggestion that since dark colours absorb and part with radiant heat more readily than light ones, it is advantageous for birds and mammals living in cold regions to be white, so as to retain as much heat as possible in their bodies, while insects are dark coloured in northern latitudes so that they may readily take advantage of transient gleams of sunshine. But as Mr. Wallace has shown in his book on "Darwinism," the principle of protective resemblance explains the white colour of most Arctic animals, and also the exceptions to this general rule, while the radiation theory cannot explain the exceptions. Still, the checking of radiation may well come in as an additional advantage for the white animals.

Mr. Poulton next discusses protective resemblances, especially in the case of lepidoptera. He of course describes the "stick caterpillars" of many geometers, and one very curious case which is worth quoting. The description is headed "A caterpillar which makes its surroundings resemble itself." "It gnaws the leaf in such a manner as to leave a number of rough models of itself attached to the midrib, and then sits down beside them. The caterpillar is green above and dark beneath, although the former colour interrupts the latter at certain points and comes into contact with the midrib on which the insect is resting. The dark colour is not distinguishable from the deep shadow behind the leaf, and therefore the appearance is that of an elongated patch of green connected with the midrib by two narrow stalks. The larva, in eating, leaves several pieces of leaf attached to the midrib by one or two stalks, which, therefore, present a very similar appearance to that of the larva itself" (pp. 36–37). The protective resemblances of the pupæ and perfect insects are next discussed, and a brief notice of similar devices in the higher animals follows. Under "Alluring Colouration" Mr. H. O. Forbes' curious case of a Javan spider which exactly resembles a bird's dropping on a leaf (even to the dried-up fluid part which has run towards the edge of the leaf!) in order to attract butterflies to their destruction, is described.

The author discusses those most wonderful mechanisms — variable protective resemblances—at considerable length. It is obvious that it is much more advantageous for a creature to be able to adapt itself to the colour of any environment in which it happens to be, than merely to have its colour fixed to correspond with the usual environment. To take one example from among the vertebrata. Trout will quickly change their colour in passing from a part of a stream with a gravelly or sandy to one with a muddy bottom. Such changes take place through the action of the coloured light upon the nervous system, and the stimulus is given through the eye. Thus blind trout cannot in this way adapt themselves. In the case of lepidopterous larvæ and chrysalides, Mr. Poulton has established by a long series of careful experiments that these changes also take place through the nervous system, but that the coloured light affects equally all the nerve-ends of the skin, and not especially the eye as in the higher animals. He also finds that when a chrysalis of the small tortoiseshell is to be suited in colour to any particular environment, the period of maximum susceptibility of the larva to the colour is the period of about eighteen hours during which it rests motionless on the surface from which it will subsequently suspend itself. The meaning of this period, then, is obviously that the larva may receive the influence which shall determine the colour of the chrysalis. The larva is, however, still slightly sensitive during the next stage, i.e. while it is suspended and before the larval coat splits. Many larvæ can also adapt their own colour to the environment in which they find themselves. Mr. Poulton demonstrates very forcibly that these wonderful adaptations could only have arisen through natural selection, and are not the accumulated result of the colours of the environment directly acting on the larva for generations.

Our author next discusses "Warning Colours," i.e. bright, conspicuous colours known by the animal's enemies to connote some disagreeable quality, and thus securing impunity to the animal exhibiting them.

Among insects especially these colours are well-marked. The original suggestion as to their significance is due to Mr. Wallace, whose attention was especially called by Mr. Darwin to the fact of many caterpillars possessing bright and startling colours, which could certainly not be classed as protective resemblances to the environment, nor as the result of sexual selection. Darwin was delighted with the suggestion, which was very soon put upon an experimental basis. Poulton's discussion of the whole subject is extremely able and very interesting. He points out that warning colours can only be adopted by a small proportion of insects in any given country, as, if anything like a large number of them adopted this means of defence, their enemies would be compelled to eat them, and would gradually get used to the nauseous taste, or even to the poisonous properties. Similarly, when insect life is scarce, species with warning colouration disappear. Thus the common ladybird hides itself carefully when the autumn comes on. Mr. Poulton points out that only a limited number of colours (black and white, black and yellow, orange or red) and of patterns, (alternating rings of different colours, or alternating longitudinal stripes for caterpillars, etc., and spots upon a background of a contrasted colour for the wings of moths and butterflies), are the most efficient for attracting the attention of the enemy, and impressing the pattern on his mind. Again the fact of there being only a limited number of warning colours and patterns facilitates the education of enemies, so that each individual insect-eating vertebrate only has to make trial of a very small number of nauseous insects, and this is of course a benefit shared by all the species protected by warning colouration. In many cases (Danais, Heliconia, etc.) sexual colouring has been made use of for warning purposes. Among these genera immense numbers of species closely resemble one another, this being an instance in which natural selection has arrested divergence in allied species for the reasons given above. It is evident that any species not possessing the unpleasant properties in so great a degree will nevertheless benefit by possessing the same or similar markings as its nauseous congeners, while the latter will share the advantage, by having their patterns more widely advertised. This leads on to cases of true protective mimicry, in which certain species not possessing special protection nevertheless share the advantages of those possessing it by imitating their patterns, and thus trading on their reputation. Such species often belong to widely different genera from those mimicked, and the close resemblance to the latter is therefore brought about by convergence of character, rather than by arrested divergence. The same remark applies to many of the cases of warning colours which have independently arisen in distinct genera. It is evident that individuals of mimicking species must bear a very small proportion to the mimicked (just as the latter to the whole insect fauna), for if they became anything like equal to them in numbers, the education of the enemies would never be complete, and the whole mechanism would break down. The theory of mimicry was first brought forward by Bates in 1862. The whole of the conclusions above summarised are of the very greatest interest; the intimately related theories of warning colours and protective mimicry, originally due to Wallace and Bates respectively, and the later developments of which we owe to Trimen, F. Müller, Meldola and Poulton, furnish a complete and beautiful explanation of the phenomena in question, which must be admitted to form a compact mass of the strongest possible evidence in favour of Darwinism.

A special kind of "Pseudaposematic colouration," to which Mr. Poulton directs attention, is seen in the case of various caterpillars possessing conspicuous tufts of hairs, which tempt an enemy to bite at them, only to get a mouthful of hairs for its pains, while the caterpillar escapes! Mr. Poulton kept a marmoset, a chameleon and some lizards, which he seems to have treated rather badly, inducing them to eat various insects which he suspected of warning colouration, etc.! "A caterpillar of the common vapourer moth (*Orgyia antiqua*), was introduced into a lizard's cage, and when attacked, instantly assumed the defensive attitude, with the head tucked in and the 'tussocks' separated and rendered as prominent as possible. An unwary lizard seized the apparently convenient projection; most of the 'tussock' came out in its mouth, and the caterpillar was not troubled further. The lizard spent a long and evidently most uncomfortable time in trying to get rid of its mouthful of hairs" (pp. 198–99). On another occasion an adult lizard refused to be taken in in this way! Similarly our author gave the chameleon a lesson with a bee, which it did not forget.

Various interesting examples of mimicry of other kinds than that related to warning colouration, and for both aggressive and protective purposes, are given by Mr. Poulton, but we have no space to mention any cases.

In the chapter on "Colours produced by courtship," Mr. Poulton argues strongly in favour of Darwin's theory of sexual selection, and defends it from the attacks of Wallace and others. He certainly appears to have made out a very strong case, and his criticism of Wallace's unsatisfactory and rather vague alternative theory of the production of sexual colour by "surplus of vital energy" etc., appears most conclusive. One of his best points is that such a theory does not in the least account for the æsthetic value of such colours, which so distinctly differentiates them from warning colours, for instance, which are merely designed to be conspicuous. Nevertheless, as indeed the author admits, there is no hard and fast line between the two categories, one kind of colour being sometimes utilised for the other purpose. And everyone is by no means agreed as to the beauty or otherwise of some warning colours. Thus considerable difference of opinion prevails as to the beauty or crudeness of the colouring of a tiger moth's wing, and many other instances might be cited. And even if we grant the existence of a widely-spread æsthetic sense among animals, we are confronted with the extremely difficult question of its origin. Professor Ray Lankester thinks this may be explained by supposing the power of distinguishing between light of different refrangibility to be a primary function of the retinal cells, and the stimulation of the brain caused by the incidence of the different light rays to be a pleasant sensation, normally accompanying the healthy activity of nervous mechanism. But even if we admit this, we are no nearer to an explanation of why what we call harmonious grouping of colours should be particularly pleasant to an insect. Mr. Poulton argues that our own æsthetic taste has been largely created for us by insects through the production of the colours of flowers, and of their own sexual colouration, by their selective action. He uses the fact of the production of the former as evidence for the production of the latter by the same means, but the argument is hardly fair. It is, as Mr. Wallace has shown, quite possible to explain the former on the principle of recognition markings, without supposing a special æsthetic sense at all; and it is obviously better to explain the one set of phenomena by an intelligible principle, such as the operation of natural selection, through the necessity of there being means of recognition of, and distinction between, different flowers adapted to different insects, than to put them both down to a supposed primary sense, the origin of which it is almost impossible to explain. Whether in reality the necessity for recognition markings in flowers, and the advantage conferred on the latter by increased conspicuousness, led to the insects taking pleasure in similar colours in the opposite sex, and finally to the production of our own æsthetic sense, is another and very difficult question. Mr. Poulton records some most amusing observations of an American naturalist on the courtship of certain spiders, some of which certainly seem to furnish support for the Darwinian view of Sexual Selection; but we must beware of inferring from the great attention paid to courtship in both sexes, that the female necessarily chooses the best-adorned male.

Mr. Poulton closes his book with an elaborate Table, in which the various colours of animals are classified according to their use, and precise terms, which embody a short general definition, are employed to distinguish between the various categories. It is perhaps doubtful whether his terms will come into general use, but they are extremely useful in giving one clear ideas on the relations of the various functions of animal colours. Subjoined is a condensed table shewing the main divisions.

There is no need to remark upon the get-up and typography of one of the far-famed "International Scientific Series." The woodcuts are fairly good. Mr. Poulton's style is admirably clear and lucid, and he may be congratulated on having produced an able and delightful book upon a most fascinating subject.

I.—Apatetic Colours. Colours resembling some part of the environment on the appearance of another species.		II.—Sematic Colours. Warning and signalling colours.	III.—Epigamic Colours. Colours displayed in courtship.
A. *Cryptic colours.*—Protective and aggressive resemblances.	B. *Pseudosematic colours.*—False warning and signalling colours.		
1. *Procryptic colours.*—Protective resemblances.	1. *Pseudaposematic colours.*—Protective mimicry.	1. *Aposematic colours.*—Warning colours.	
2. *Anticryptic colours.*—Aggressive resemblances.	2. *Pseudepisematic colours.*—Aggressive mimicry and alluring colouration.	2. *Episematic colours.*—Recognition markings.	

A. G. Tansley.

BOTANICAL RAMBLES ABOUT ABERYSTWITH.

To the lover of botany Aberystwith is a centre of attraction. The physical aspect of the district is as varied and beautiful as its flora. Its climate is mild and salubrious, and it possesses the distinct advantage of being so situated as to enable the spectator to obtain a full view of the whole coast-line of Cardigan Bay, from Bardsey Island in the north to Cardigan Head in the south. The monotony of the waters—if not broken by the heaving billows—is relieved by the heights of Snowdonia. Here, Nature never fails to welcome her visitant; and should he ever weary of the sea, now calm and azure-coloured, and anon moaning and dashing its white, foaming breakers against its rocky barriers, or of the scarped cliffs of old Valentian rocks, hoary with age, with their strata super-imposed like the leaves of a book, and having impressed on their stony pages an autobiography far more romantic and wonderful than the wildest imagination can fancy; should he grow weary of such marine sights and scenes as these, he can easily retreat to the country and enjoy rural sights and sounds, where grow the

"Bramble roses faint and pale,
And long purples of the dale,"

and where the air is laden with the fragrance of the gorse and the honeysuckle, and where the songs of the linnet and the lark are wafted by the winds over wood- and moor-land. In the neighbourhood are many places that will well repay a visit, lovely valleys, picturesque ravines, and hills and cascades of Swiss-like beauty. The lead-mining industry—which once flourished, and still lingers in this part of the Principality—has polluted the waters of the principal rivers—the Rheidol and the Ystwyth—poisoned their fish, and destroyed the luxuriant vegetation of their banks. With depressed and declining trade the rivers return to a state of purity, and once more teem with life and beauty. The fry thrives in their waters, and vegetation marches in full colours to their banks. It is not our intention to give an exhaustive list of the plants of this locality. For the present we shall only make a rapid review of some of the most conspicuous and characteristic. Commencing with the shore with its peculiar glaucous vegetation, we find growing in the shingle and the sand :—The sea holly (*Eryngium maritimum*), with its foliage and inflorescence well-armed with spines against the pilfering visitor. The yellow-horned poppy (*Glaucium luteum*) is fast becoming a rarity at this, as well as at other watering-places. The henbane (*Hyoscyamus niger*) has retired to Clarach Sands. The scurvy grass grows in profusion on the cliffs, and in some parts depends in trellis-forms to the water's edge. The sea plantain (*Plantago maritima*), convolvulus, plantago and spergula are also represented. On the castle grounds we meet with rest-harrow (*Ononis spinosa*), mallow (*M. rotundifolia*), white and yellow stonecrop, and here thrift (*Armeria vulgaris*) makes good its name and adorns the grassy soil and the bare cliffs. This little plant is outside the pale of protection, and thoughtless folk grub it up mercilessly. The wild thyme (*T. serpyllum*) carpets the dry slopes, and the scurvy and whitlow grasses and the pennywort find a living in the crannied walls of the old castle. On Plascrug Road, the swine cress (*S. coronopus*), common yellow rocket (*B. vulgaris*), common hedge mustard (*Sisymbrium officinale*), and the common vervain (*Verbena officinalis*). On the flats the yellow flag (*Iris pseudacorus*), willow herbs (*E. hirsutum* and *parviflorum*), and in and near isolated shallow pools are water crowfoots (*R. aquatilis*), meadow queen (Spiræa), pondweeds (*Potamageton natans* and *lanceolatus*), bur-reed (*Sparganium ramosum*), and the myriad duckweed often give Pwll Simon the appearance of a miniature Sargasso Sea. The spurge, fumitory, pimpernel, and the ground ivy grow in profusion about the cemetery, while the yellow fumitory (*Corydalis claviculata*), St. John's wort (*Hypericum perforatum* and *montanum*), centaury (*Erythræa centaurium*), pepperworts, white dead-nettle (*Lamium album*), common columbine (*Aquilegia vulgaris*), greater celandine (*Cheledonium majus*), poppies (*P. Rhœas, Lamottei* and *Argemone*), the dog's mercury (*Mercurialis perennis*), in every patch of which the male plants far outnumber the females, and the wild hop may be found about Rhydfelin. The hills abound with wild sage, yellow bedstraw (*Galium verum*), heath, heather, the Burnet rose (*R. spinossissima*), and the whortleberry. The metalliferous slates of the higher hills produce a fine variety of pansy (yellow), and damp places are the battlefields of the butterworts (*Pinguicula vulgaris*) and the sundews, where they capture and devour hosts of little insects that invade their strongholds. We should not leave unnoticed the tiny milkwort (*Polygala vulgaris*), with its quaint flowers of various hues, and the golden saxifrage (*Chrysosplenium oppositifolia*), which gilds with bright golden many a watery clod. Orchidaceæ are represented by *O. maculata, latifolia, pyramidalis*, and the lady's-slipper (*Cypripedium calceolus*). Ferns have become quite rare, but among others we have observed the hart's tongue (*Scolopendrium vulgare*), *Asplenium trichomanes, A. adiantum-nigrum, A. marinum*, and *A. ruta-muraria*, as well as "that most aberrant of the families of ferns," the adder's tongue (*Ophioglossum vulgatum*).

It may not be amiss to notice here the important part played by plants as agents of reconstruction. This is well illustrated in many parts of the wild west coast of Wales, where the tenacious clasp of vegetation arrests the drift of the dunes despite the fierce gales which blow across the Atlantic. Foremost and first to appear on the moving sand are the sea maram (*Psamma arenaria*), with its creeping rhizomes, often several yards long, and the sand carex (*Carex arenaria*). Then follow the knotgrass, *Silene maritima, Convolvulus soldanella, Erodium maritimum, Rumex maritimus;* and the silverweed, Burnet rose, and innumerable grasses bring up the rear.

G. REES.

CURIOUS ORGANS OF THE LARVA OF THE CLICK-BEETLE.

VERY recently I became possessed, by exchange, of a slide of the larva of the click-beetle, better known perhaps in agricultural circles as the wire-worm. In such a common and well-known larva I did not expect to find anything strikingly new ; but from inquiries I have since instituted, it would

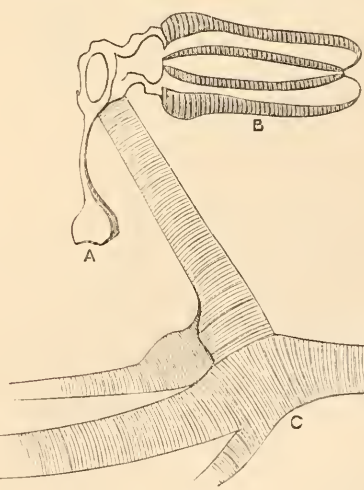


Fig. 123.

appear that very little, if anything, is known about some remarkably curious stalked organs very readily seen in both the larvæ on my slide. It is an ordinary balsam mount, and the flattening process has very materially increased the difficulties of interpretation.

The larva has apparently thirteen segments (counting the head one), the three segments of the thoracic region each bearing its pair of legs; and on the last segment are a pair of organs, which from their structure I conceive to be suckers (Fig. 124, under the 1-in. obj.). The special organs, however, whose functions I am unable to imagine, are found in pairs upon all the segments except the first, second, fourth, and last, and are quite dissimilar to any other organ with which I am acquainted.

At the first glance they bear a considerable resemblance to some of the stalked diatoms (Cocconema), even to the horizontal markings. Various hypotheses presented themselves to my mind, none of which were satisfactory; so I handed over the slide to a well-known entomologist, with a request that he would examine it, and tell me something of the function and homology of the organs in that the organs were internal, which point, owing to the flattening of the preparation, I had overlooked. A careful use of the illuminating pencil and of the fine adjustment readily confirmed this point. I give a drawing of one of these organs under the $\frac{1}{4}$-in. obj., taken from the seventh segment of one of the larvæ, in which the connection with the breathing-tubes is more clearly shown than in any of the others (Fig. 123). Under the microscope, the attachment of the stalk to the integument of the larva first comes into focus (Fig. 123*a*); then the diatom-like head (Fig. 123*b*); while deeper still in most cases the longitudinal trachea come into view (Fig. 123*c*). He concluded his letter by saying that the organs were possibly analogous to the apparatus for producing sounds possessed by some insects, which are situated just inside the spiracles. Strange to say, I have been unable to find any spiracles, or any

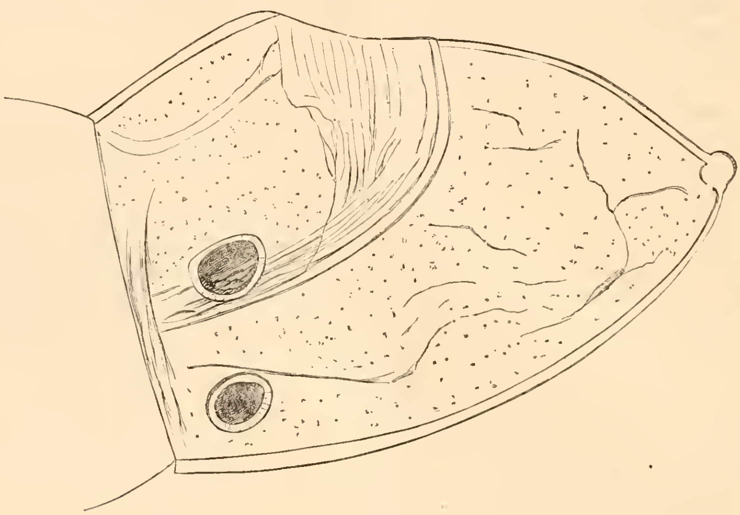


Fig. 124.

question. It was returned with the bare statement, that they were the spiracles. Now, although I make no speciality of entomology, yet the constant use of the microscope for over twenty years has made one acquainted with the many forms of breathing-pores possessed by widely different genera of insects; and these were totally distinct from any form of spiracle with which I was acquainted. I wrote to my friend, pointing out these differences—to the fact that there was no apparent aperture, and to the more remarkable fact of their being stalked, which latter point I thought he had overlooked. He desired the opportunity of a further examination, which, being afforded him, resulted in a long letter, with explanatory drawings, in reply. He acknowledged having been too precipitate in designating them spiracles; but pointed out their close connection with the trachea—a fact I had myself noticed; and opening in the integument, except the suckers on the last segment.

Is it possible that I have mistaken the function of these latter, and that they are spiracles? I think not, as they have wide, trumpet-shaped mouths, identical with the suckers so common on many insects.

In any case, here are several interesting points awaiting solution, and as in some districts both the beetle and its larva are readily procurable, I suggest an examination of living specimens, and dissections of recent ones, to those readers of SCIENCE-GOSSIP who have the opportunity, and doubt not but that some of them will be able to throw some light upon what appears to me a very interesting and puzzling structure in the organisation of one of our commonest insects.

J. E. LORD.

Rawtenstall.

CONCERNING MANURES.

By F. Barker Cooke, F.C.S., F.L.S.

[*Continued from p.* 210.]

To supply these elements the following manures are used :—

Farmyard manure.—This is by far the most perfect manure, for it contains all the constituents required by cultivated crops, as may be seen from the following analysis by the late Dr. Voelker :—

		Per cent.
Water		75·42
*Soluble organic matter		3·71
Soluble ash		1·47
Silica	0·254	
Phosphate of lime	·382	
Lime	·117	
Magnesia	·047	
Potash	·446	
Soda	·023	
Sodium chloride	·037	
Sulphuric acid	·058	
Carbonic acid and loss	·106	
†Insoluble organic matter		12·82
Insoluble ash		6·58
Silica	2·434	
Oxides of iron and alumina	·947	
(Containing phosphates equal to phosphate of lime)	·573	
Lime	1·667	
Magnesia	·091	
Potash	·045	
Soda	·038	
Sulphuric acid	·063	
Carbonic acid and loss	1·295	
		100·00

But farmyard manure has a further advantage over all other manures, in that it physically improves the land by rendering it porous and thus accessible to air. It consists of the excrements of cattle, their litter and the refusal of their fodder, well trodden down and partly fermented, and then removed to a convenient place, where it is made into a heap for future use. Its composition naturally varies with the kind and condition of the animals producing it, the richness of their diet, the quality and quantity of litter, and with its subsequent treatment. Thus, fattening cattle void richer manure than lean ; older than young, which retain much of the phosphates to form bone and of the nitrogenous substances to form muscle and blood ; and those fed on oil-cakes or leguminous seeds than those on oats, hay, or potatoes. The manure should be thoroughly well mixed, as the solid and liquid portions differ in composition, the former containing most of the phosphoric acid and lime, the latter the alkaline salts and nitrogenous substances. Care should, therefore, be taken not to lose any of the urine, but to collect all not absorbed by the straw by means of drains. The yard should also be well protected from rain, which would wash away many of the valuable ingredients. By storing the manure in heaps and covering it with mould it is kept moist and unexposed to the air, which prevents the formation of mould and too rapid fermentation. The organic matters are decomposed, giving off carbonic acid gas, and from this cause and the loss of moisture the heap grows less both in bulk and weight. All the mineral constituents remain, but some of the insoluble are rendered soluble ; and the nitrogenous substances, such as urea, are decomposed with the formation of ammonium-salts. If applied in autumn, farmyard manure is best ploughed in fresh, but if in spring it should be well rotted so as to be at once available for plant-food. If farmyard manure be not made on the farm, or cannot be obtained in the immediate neighbourhood, it is more economical to use artificial manures which contain the fertilising matters in a concentrated form.

Guano is the next important manure, as it is also of complex composition and contains both mineral and nitrogenous constituents. It consists chiefly of the excrements of innumerable aquatic and fish-eating birds, such as penguins, gannets, cormorants, etc., and in some places that of seals. It was used as a manure by the Peruvians in the time of the Incas, under whose rule most stringent laws were enacted for the protection of the birds. It occurs in extensive deposits on the coasts of Peru and Bolivia and on the adjacent islands ; and it was from Peru that Baron von Humboldt first brought some to Europe in 1804. Since then deposits of guano have been found at the Ichaboe Islands and Saldanha Bay on the south-west coast of Africa, the Kooria Mooria Islands on the south coast of Arabia, Sombrero and Navassa, uninhabited islands in the Caribbean Sea, and various other places. It is only in rainless, or nearly rainless, countries that nitrogenous guanos can be formed, for many of their constituents are soluble in water. Guanos differ very much in composition and are sometimes divided into "nitrogenous-guanos," such as Peruvian and Chincha Islands, and "phosphatic-guanos," in which most of the soluble and nitrogenous substances have been dissolved out by rain, and which are, consequently, rich in phosphate of lime. Some Bolivian, Navassa, and Sombrero guanos are examples of phosphatic guanos, which are generally ground to fine powder and treated with sulphuric acid, which decomposes the phosphate of lime and forms super-phosphate. Guanos thus

* Containing ·297 per cent of nitrogen, equal to ·360 per cent. of ammonia.

† Containing ·309 per cent of nitrogen, equal to ·375 per cent. of ammonia.

Total ammonia in the free state = ·046 per cent.

" " " form of salts = ·057 " "

treated are termed "phospho" or "dissolved" guanos. From analyses made by several well-known chemists some forty years ago, the following average results were obtained :—

	Ammonia. Per cent.	Phosphate of Lime. Per cent.
Peruvian	17	25·12
Angamos . . .	20	20·25
Ichaboe Is. . . .	7	31·50
Patagonian . . .	2·5	47·40
Saldanha Bay . .	1·5	55·84
Kooria Mooria Is. .	0·25	15·66

But it appears that all the old guano (and phosphate of lime, too,) beds have become exhausted, as the percentage of ammonia in guanos is now a third, or even less, of what it used to be. The use of guano as a manure requires some care, on account of its richness and powerful action. It is best to plough it well into the soil, and in no case whatever to drill it in with the seed. It tends to promote excessive development of foliage, and hence is applicable to grass, although it is often used as a general manure.

Phosphate of Lime is, however, more universally used for manure than guanos, owing to the expense of the latter. It is very generally distributed in some form or other over England, Europe, and parts of America. Some time back, nodules, oval in shape and consisting chiefly of tricalcic phosphate, were found at Lyme Regis and Lewes. These were termed "coprolites." (kopros, dung, and lithos, stone) by Buckland, who explained their occurrence as being fossilised fœcal matter, the excrements of extinct animals, the internal spiral structure which they exhibited being due to the form of the intestinal canal through which they had passed. But the name "coprolites" is now applied to all phosphatic nodules, however formed. Pseudo-coprolites abound chiefly in Cambridgeshire and Bedfordshire, the best of the former containing about 58 per cent., and of the latter 51 per cent., of tricalcic phosphate. The phosphates of France occur chiefly near Boulogne and in the Ardennes, good samples of the former containing about 46 and of the latter 76 per cent. of tricalcic phosphate. Boulogne phosphates generally contain a large percentage of sand. Canadian phosphates are more or less crystalline and may contain about 76 per cent. of phosphate of lime, but with a little calcium fluoride or fluoride and chloride together, and its formula may be written $3Ca_3(PO_4)_2 + Ca(F_2Cl_2)$. Sombrerite is probably produced by the action of water or rain filtering through the guano deposits and converting the carbonate of lime of the coral-rock into phosphate. Other phosphates are obtained from Navassa, Curaçao, and South Carolina. But phosphate of lime occurs also in other substances; thus bone-ash (burnt bones) contains about 70 per cent., animal charcoal 70 to 80, and bone-dust 48 per cent. The latter also contains about 4½ per cent of ammonia. But none of these phosphates would be of any use as they are, for tricalcic phosphate is practically insoluble in water, and plants can only absorb salts in solution. The phosphates must therefore be rendered soluble, and to do this Liebig in 1840 suggested treating them with sulphuric acid. The action that takes place is theoretically as follows :—

$$Ca_3(PO_4)_2 + 2\,H_2SO_4 = CaH_4(PO_4)_2 + 2\,CaSO_4.$$

(Tricalcic phosphate and sulphuric acid give calcium hydrogen phosphate, usually called super-phosphate of lime, and calcium sulphate, usually called gypsum.)

The phosphates are ground to a fine powder, about half its weight of acid is added, and the whole mechanically mixed. The syrupy super-phosphate is run off the deposited gypsum and dried. The manure then consists of super-phosphate of lime, gypsum, free sulphuric acid and undecomposed tricalcic phosphate. But we have seen that manures should also contain nitrogen and potash, more especially the former; different substances are thoroughly mixed with the syrupy super-phosphate before drying, and thus form the different special manures, as, for instance, "potato-manure," "turnip-manure," etc. These substances may be ammonium-salts, generally the sulphate, dried blood (containing from 10 to 15 per cent. of nitrogen), wool-refuse (with 4 to 8 per cent. of nitrogen), rape-cake (with 4 to 5 per cent. of nitrogen), soot, sodium and potassium, nitrates, etc. Owing to the soluble nature of these manures the rain diffuses them throughout the soil. The acid phosphates attack the carbonate of lime there present, and are re-converted into tricalcic phosphate, which is precipitated in, however, a so-finely-divided condition as to be readily decomposed again by the acid juices of the plant. Super-phosphates are chiefly used for turnips and root-crops.

Seaweed is used near the seaside, and is nearly as valuable as farmyard manure.

Soot, used sometimes for corn, contains from 1 to 3 per cent. of nitrogen.

Ammonium Sulphate contains about 20 per cent. of nitrogen, but is usually mixed with super-phosphate.

Sodium Nitrate contains about 15·6 per cent. of nitrogen, and is used as a top-dressing for wheat in March or April, when it can be at once utilised by the crop, as otherwise it would be washed away. It is brought from Peru, where it occurs as an incrustation on the soil of some feet thick. It is often mixed with dry super-phosphate.

Bones may be used whole or ground, but decompose very slowly. They are now generally converted into super-phosphates.

Kainite contains about 13 per cent. of potash, and consists chiefly of the sulphates of potassium and magnesium, magnesium chloride and water. Its formula may be written $K_2 SO_4 . Mg So_4 . Mg Cl_2 . 6 Aq.$, and it is found in large quantities at Stassfurt in Prussia. It is a valuable manure for grass, but most crops are greatly benefitted by its use.

Wood-ashes are also used as a potash-manure.

Common Salt seems to be coming more and more into use. It serves as a diluent of potash salts, and also assists the solution of other salts in the soil.

Lime, Chalk, and Marl are all used as manures, but their action has already been described.

Thus we have seen the composition and use of the principal manures, but there are many others used for special purposes, as, for instance, manganese compounds for roses, and sodium carbonate for hyacinths, which would take too long even to enumerate.

To rightly and economically use manures we must know what constituents are deficient in the soil, choose the best means to remedy this, and apply them in such a way as to effect the most good and least waste.

CRUSTACEAN LIMB RENEWAL.

By Albert H. Waters, B.A., etc.

THE renewal of lost limbs in the crustacea is a marvellous fact. One of my shore-crabs (*Carcinas Mænas*) got fighting with another of his kindred, and came off second best in the combat, losing both his claws and three of his legs. For weeks he lived a miserable cripple with only five out of his eight legs remaining, and in default of his lost claws he was compelled to use two of his legs to feed him-

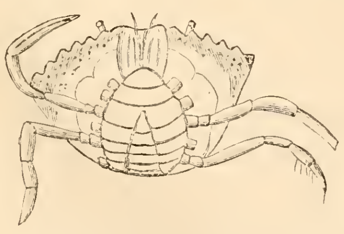


Fig. 125.—Mutilated shore-crab just before exuviation.

self with. At length he exuviated, and no sooner had he done so than he appeared with his full complement of limbs and claws. This sudden renewal is where the marvellous part of the matter is. It would have been less surprising, although wonderful enough, had the new limbs budded and gradually grew; but to be suddenly and miraculously renewed in this way seems most marvellous.

I have had similar occurrences before, but it is nevertheless very wonderful. If this be the usual manner in which lost limbs and claws are renewed,

Fig. 126.—Mutilated shore-crab mmediately after exuviation.

how is it done? One would be inclined to think the greater part of the crustacean, so to speak, dies before the exuviation; for it is well-known that crabs refuse food some days before they cast their shells, and lose their solidity of flesh, which turns for the most part soft and fluid. Nevertheless, they have strength in their claws, as I know by experience, for they are very tetchy at that time. It seems as if the wasted part of the crab grows again rapidly, by means of the blood sent from the heart, while the substance is soft.

Something of the same nature takes place in the wings of moths and butterflies. We see in their case a very small soft mass expand by means of the blood sent through its veins, and grow larger and larger. By the same influence we see the chitinous scales (which the microscope shows are originally exceedingly minute and rudimentary) also grow and speedily harden. The muscles, of which there must be a large supply in order to enable a butterfly or a moth to flap it wings so energetically, seem at the same time to develop, and from their soft flabby rudimentary condition become firm and strong enough to enable the insect to soar up into the air.

Prawns exhibit the same phenomenon of renewing their limbs, and the operation is performed in much the same way. In no crustacean has the writer ever seen the limb grow gradually, or show any signs of doing so until the old shell exuviated, when the process has taken place all at once.

Cambridge.

From Mr. P. Erine, San Francisco, we have received a thoughtful pamphlet entitled, "The Principles of Mechanics as Applied to the Solar System" (price 50 cents).

NOTES ON NEW BOOKS.

INTRODUCTION TO FRESHWATER ALGÆ, by M. C. Cooke, M.A., LL.D. (London: Kegan Paul & Co.). This is one of the well-known red volumes of the International Scientific Series. A good work on British Freshwater Algæ has long been required, and no man was better capable of preparing it than Dr. Cooke. The price (5*s.*) brings it within the reach of every student of practical botany. Dr. Cooke is one of the most lucid of our scientific expositors. The reader follows his clear statement of facts without the slightest difficulty, and all earnest students will feel a debt of gratitude to the author for this admirable work. The chapters are as follows:—Introduction, Collection and Preservation, Cell-Increase, Polymorphism, Asexual Reproduction, Sexual Reproduction, Conjugation, Pairing of Zoospores, Alternation of Generations, Spore Germination, Spontaneous Movements, Notable Phenomena, The Dual Hypothesis, Classification. Nearly half the book is occupied by the most useful arrangement and enumeration of the British species. The thirteen plates illustrate all the genera, and the figures, one hundred and eighteen in number, are clearly and exquisitely drawn. This is a book which needs no recommendation; it brings its own recommendation with it. We may add that there is appended a very full and useful glossary of terms.

Zoological Types and Classification, by W. E. Fothergill, M.A., B.Sc. (Edinburgh: James Thin). This will prove a very useful work of reference for zoological teachers and students, inasmuch as it gives a summary of all the important classes of the animal kingdom, together with the general anatomy of a large number of types. To students attending lectures on these subjects it will prove exceedingly useful.

The Diseases of Crops and Their Remedies, by A. B. Griffiths, Ph.D., &c. (London: Geo. Bell & Sons). Young farmers, market gardeners, and agricultural students generally, will find this little book of much value. The day is fast approaching when the new school of agriculture will be obliged to make certain departments of zoology and botany a practical study. It is estimated that at least one-sixth of the crops and vegetables we grow is sacrificed through the ravages of insect pests and parasitic fungi, of which the majority of cultivators know little or nothing. Dr. Griffiths in this manual discourses in five chapters upon the diseases of leguminous crops, the parasites of beans, clover, lucern, peas, trefoil, vetches, etc.; the diseases of root-crops and the various parasites of beet-root, carrots, turnips, mangel, onions, parsnips, potatoes, etc.; also the diseases of gramineous crops or cereals, and the several parasites of wheat, barley, oats, rye, grasses, rice, etc. There is also one chapter devoted to the diseases of miscellaneous crops, such as hops, cabbages, celery, lettuces, tomatoes, cucumbers, asparagus, etc. There is a useful little concluding chapter on the microscope, and an exceedingly good index.

Handbook for Lincolnshire, with map and plans (London: John Murray). This is an age of guide-books, but Murray's Handbooks hold their heads high above them all on account of the extensive learning imported into them, and the general precision and accuracy of their information. They are not only guide books to the topography of a district, but manuals of the archæology, geology, botany, and local history. The present volume has been brought up to the most recent date, insomuch that it may be almost regarded as an original work. The fact that Lincolnshire has no trustworthy county history renders the present volume all the more valuable.

Wild Nature won by Kindness, by Mrs. Brightwen (London: Fisher Unwin). This is a book very delightful to read, prettily illustrated by the author and Mr. F. C. Gould, and nicely printed and got up. It is a little work of the old-fashioned natural history kind which we are glad to see is coming into favour again, as it tends to promote observers and increase the number of the lovers of nature. In this book we have twenty-nine short chapters, all of them pleasantly written, and many of them containing valuable hints as to the feeding of pets.

Sap: Does it Rise from the Roots? by J. A. Reeves (London: Geo. Kenning). Mr. Reeves is strongly of opinion that the commonly received doctrine that sap rises from the roots has no evidence whatever to support it, and that instead of water ascending and gases descending, the facts he adduces in this little volume prove that water descends into the roots and that gases ascend to the leaves. His chief theoretical reasons for this being the case is, that it is in strict conformity with the laws of gravitation. But Mr. Reeves is intelligent enough to know that gravitation does not get all its own way amongst organic beings, otherwise we ought logically to take in the air we breathe from our toes, which would also account for the general gassiness of many people's heads. We are afraid that Mr. Reeves will not convert many botanists, but the latter would do well to read the many original experiments the author sets forth in his books, and which are of high interest. The author explains his own views very clearly.

Principia; or the Three Octaves of Creation: A new Eirenikon, by the Rev. A. Kennion, M.A. (London: Elliot Stock). This is a book crowded with learning of a certain kind, but which comes upon us as the vision of a great conundrum. It bears evidence of large and extensive reading, and is evidently devoted to a geological harmonisation of the six days of creation. The author's main purpose, as we judge from the chart, is that the "Three Octaves of Creation" are represented by the "Word, the Work, and the Seal." He holds that the Bible in its first two chapters gives us the yesterday of our world's history, whilst its last two chapters tell us of the morrow.

Through North Wales with a Knapsack, by four schoolmistresses (London: Kegan Paul & Co.). A delightfully bright little book, full of interest from end to end, and a well-written little book as well. These four brave and intelligent girls did a seventeen days' holiday from Birmingham and back for £4 10*s*. each, and seem to have enjoyed themselves amazingly. We wish every young woman could go and do likewise. They appear to have been keenly alive to the botany, geology, archæology, etc., of the districts they walked through, and this book is a useful record of their unadventurous adventures.

Advanced Physiography, by John Mills (London: Chapman & Hall). This highly useful and well-compiled work might perhaps be chiefly termed "Physiographic Astronomy." It is written for South Kensington students by a late Demonstrator in the practical courses of astronomical physics at South Kensington, so that the author knows what he is writing about, and the readers he addresses. General scientific readers will also find Mr. Mills' book a compendious as well as comprehensive Manual of Modern Astronomy in its various branches.

Half-Hours at the Sea-Side, by Dr. J. E. Taylor (London: W. H. Allen & Co). This is a new edition, brought up to date as regards its matter, of a book written by the editor eighteen years ago, which the public has been good enough to constantly require new editions of up to this latest and thoroughly revised issue. Its present bright appearance does not disgrace the earlier editions; and, as regards type and illustrations, it perhaps surpasses any of them.

A VISIT TO TORY ISLAND: THE SENTINEL OF THE ATLANTIC.

ABOUT six-and-a-half miles off the north-west corner of Donegal is situated the small island of Tory, which a few years ago was familiar to most people as the place where the ill-fated "Wasp" was lost with nearly all hands. It has been called the "Sentinel of the Atlantic," for it is the first land made by vessels bound for Liverpool *viâ* north of Ireland, and it has a powerful light and fog-horn on its western extremity. It is about two-and-a-half miles long by three-quarters of a mile wide, bounded on the north by precipitous granite cliffs, which are indented deeply in a fantastic manner forming all sorts of little bays and islands with deep water close in, while on the southern side it slopes gently down to and under the water. Along the southern edge and western end it is thickly strewn with granite blocks and boulders, which in heavy gales, when the waves rush high up on the beach, are tossed and rolled about in all directions. Some parts on the eastern end of the island are thickly strewn with small pieces of a fine-grained granite. The surface of the island is fine turf, though this is being rapidly removed for fuel by the inhabitants. There is not a tree or bush to be seen, still there are numbers of pretty wild flowers and a few ferns.

Camusmore Bay, the principal landing-place, is a small indentation in the centre of the island on the south, and here is situated the chief village. On landing, the most noticeable object is the ruined round tower. All sorts of theories have been suggested as to its use. It seems most likely that it was used by the inhabitants, in times of trouble, for the storage of their valuables, and possibly also as a last stronghold, if their other defences failed. There is no doorway, entrance being obtained through a window which can be reached by climbing up the side of the tower. In the little graveyard attached to the chapel are some curious old stones, many of them carved on, among them one which has a remarkable resonant sound when struck, and is supposed to have been used for the purpose of summoning to church before they had a bell. It is a coarse granite stone, and although there are several others of exactly the same substance about, none sound as this one does. The inhabitants number about 300, all of whom are remarkably healthy * and appear very happy and contented, and much attached to the island. It is a singular thing the little value they place on the services of a doctor, and always submit to his kindly offices with a sort of protest. The male inhabitants are chiefly employed in fishing, egg-gathering, and burning kelp. The women garden and gather kelp. The kelp (large coarse brown seaweed thrown up in large quantities on the beach) is gathered in panniers thrown over the backs of ponies. On the road to the gathering ground the women ride them, sitting very far back sideways and bare-backed, and are most skilful in the management of their frisky little animals. The kelp is burnt in kilns, which are long troughs made in the ground, and the sides of which are built up with stones. After burning some time it becomes a solid clinker-like mass, which is broken up into blocks and sold to chemical works for about 70*s*. a ton. The women go about barefooted, and it is very noticeable what delicate features many of the young women have; but they age prematurely, the result of their hard work and exposure.

On the eastern point of the island just by Port Doon (where the telegraph cable lands) are a few houses, and the remains of an old encampment, the last stronghold of the Irish against the English invaders. The story runs, that an English captain

* Three women died last year (1889) each over 100 years old.

with an armed party followed the remnants of the Irish, who were led by two chieftains, on to the island, the latter entrenching themselves at this spot, where they were besieged by the English. Soon, however, dissensions broke out in the camp of the Irish, one chief wishing to surrender, and the other to hold out, till at last they came to blows. The English captain, taking advantage of this, slew all, except five, who hid themselves in the rocks. On this spot is also situated the "Wishing Stone," a granitic overhanging pinnacle, about two hundred and eighty-two feet above the sea.

Geologically speaking, the island is interesting as one of the outlying pinnacles of the ancient continental mass, which originally extended out in this direction; but it is slowly and surely disappearing under the combined influences of the weather and sea. At the north-east corner is a remarkable narrow mass jutting into the sea for about two cables, called Tormore, the outer end of which is one of the highest points in the island, and it is so narrow that only an experienced climber can go along the top of it to the outer cliff. On the top are several weather pinnacles left, called "the chimneys," and here the "weathering" of the granite can be well studied; the granite splitting up into large cubes first, and these into smaller, and so on, until in places small pieces can be removed by the hand. I noticed three varieties of granite, a coarse-grained, a medium-grained of a greenish colour, and a fine-grained.

The island is chiefly covered with a fine grass of a mossy nature, which makes a good peat, and in places is quite boggy; and this is thickly strewn with wild flowers, chiefly daisies, buttercups, and two kinds of a flowering moss, one with a red flower, the other with a blue flower, and very similar to what is found at many seaside-places in England; there are also several kinds of ferns, and in the little pools the water-crowfoot grows plentifully; animals are scarce—only a few rabbits. Of birds there were rock-pipits, rooks, jackdaws, and pigeons, sometimes peregrine falcons. Sea-birds were very numerous, common black-faced and black-backed gulls, shags, cormorants, gannets, petrels, puffins, guillemots, and razor-bills. On the cliffs, particularly about Tormore, the birds build in immense numbers, and it is curious to note how the different species keep to themselves. For instance, one strip of the cliff from top to base will be occupied by puffins, another strip by guillemots, another by gulls, and so on, the gulls taking the most inaccessible strips, while the puffins take the easist of access. At one place I succeeded in climbing quite close to a puffin-rookery, and obtaining a photograph of the birds. When startled from the cliffs they fly up in thousands. Some of the islanders are very expert climbers, and take the eggs, storing them in their hats to bring them down.

Fish is plentiful: mackerel, halibut, and flounders, chiefly. There are also many lobsters; and the fisheries would well bear developing, and might become a source of considerable income to the inhabitants had they modern appliances and means of getting the fish away. They have a few boats, and also use a curious little thing like a coracle, but called by them a "curragh," made of bent sticks, and covered with hide, which floats on the water like a bladder, but can only be used in very fine weather.

Limpets and mussels are common, and much eaten by the inhabitants; there are also acorn-shells and periwinkles. The common sea-anemone is very plentiful, and there are a few small corals and polyzoæ.

Now that the island is connected to the mainland by telegraph-cable (the Duchess of Abercorn opened the line on August 26th, and sent the first message to the Queen), we may possibly hear more about it. Not only should it be a valuable reporting-station for ships, but also a capital station for making observations on the movements of the upper clouds, and so giving warning of the approach of storms.

DAVID WILSON-BARKER.

66, *Gloucester Crescent,*
Regent's Park.

THE LEAF GLANDS OF PINGUICULA.

THE forms of hairs, glands, and other growth with which numberless plants are clothed are in themselves a sufficiently interesting study, but the more especially so in view of the information afforded us by Darwin, as to the uses of some of these organs in securing nourishment from sources at one time little suspected.

That the vegetable world derived sustenance from the inorganic components of the air, the earth,

Fig. 127.—× 120.

and the waters under the earth, was a matter of common knowledge and continuous study, but the discovery that some of its members had constituted themselves counterparts of the Carnivora in the animal world was something new.

Readers of SCIENCE-GOSSIP will be aware that insects, &c., caught by the viscid secretion of the leaves of the sun-dews, butterworts and others, do not merely remain until decay takes place, but are actually digested, the function being performed by means of the glands with which the leaves are furnished.

In the common butterwort (*Pinguicula vulgaris*) the general form of these glands is disc-, or cheese-shaped, somewhat resembling the fruit clusters of the mallows, but perhaps thicker in proportion to the circumference ; and there are four different developments of them, viz. three on the upper, and one on the under surface of the leaf. Of the former, whose functions are identical, the largest occur from the lower mid- to upper part of the leaf, are nine to ten hundredths of a millimetre, or about $\frac{1}{250}$ of an inch in diameter, ·03 to ·04 mm. thick, and are raised on

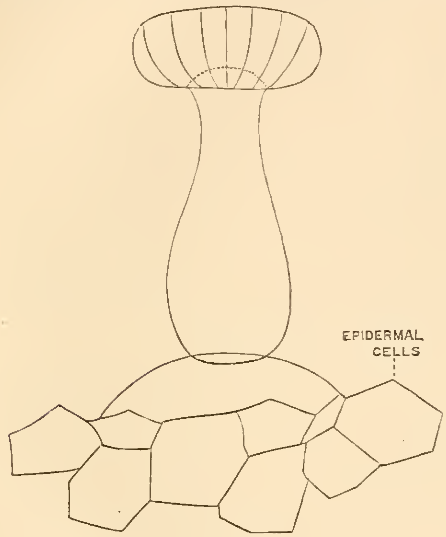


Fig. 128.—× 260.

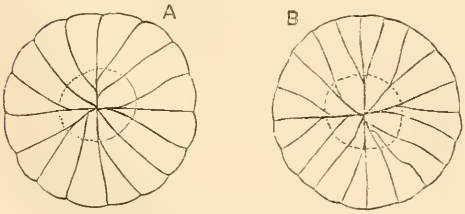


Fig. 129.—× 260.

flask-shaped unicellular pedicels about ·15 mm. or $\frac{1}{170}$ of an inch high ; ·03 mm. in diameter at the top, and twice as much at the broadest part of the base, which rests on a slight hemispherical elevation (Figs. 127 and 128). These pedicels are transparent, nearly colourless, and stand about ·2 mm. or $\frac{1}{125}$ of an inch apart. The gland itself is normally divided into sixteen cells, which do not radiate from the centre, but are the result of a successive subdivision of the walls in the course of growth. Two first formed cell-walls have intersected at right angles in the centre, and afterwards branched off at various points, more or less distant from it (Fig. 129 a). The subdivision sometimes results in the production of seventeen to twenty cells, some of which are not more than one-third of the diameter of the disc in length (Fig. 129 b). If taken from a clean leaf, the colour of the gland is light green and quite transparent, so that when viewed either from above or laterally, the top of the pedicel can be seen through it.

When by the processes of secretion and absorption the gland has assimilated some of the food supply

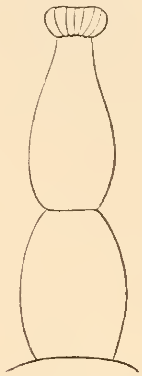
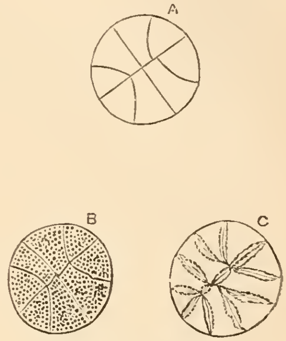


Fig. 130.—× 120.



Figs. 131.—× 260.

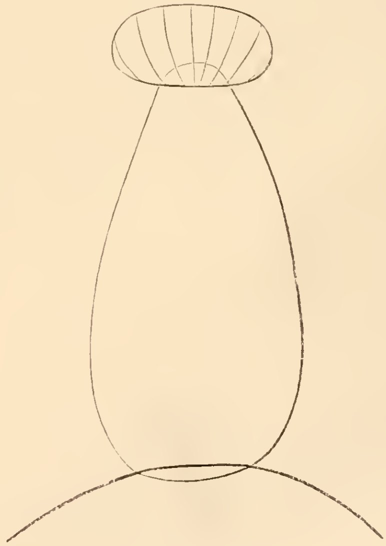


Fig. 132.—× 260.

collected on the leaf, it presents the appearance illustrated in another gland, viz. Fig. 131 b.

The second description of glands are situated towards the base of the leaf, and are similar to the above but smaller, being about ·08 mm. in diameter. Their pedicels are larger, more inflated, one-celled on the mid-lamina (Fig. 132) ; two to three-celled near and on the mid-rib (Fig. 130).

The smallest kind of glands occurring on the upper side are thickly distributed over the whole surface of the leaf, except on the margin (where there are none at all). They are about ·06 mm. in diameter, and stand on pedicels only as high as the glands are thick, viz. about ·03 mm. They are divided into eight cells. Of the two main divisional walls which intersect each other, one only has four divergent branches, viz. one on each side at each end. Sometimes there are more than eight cells, but the general appearance is very uniform. Fig. 131a represents one of these bodies in its transparent state; Fig. 132b, when filled with granular matter (protoplasm, Darwin); Fig. 133c, a ten-celled gland with the granular contents aggregated round the cell-walls, probably illustrating a stage in the gradual return of the organ to its normal condition, in order to be

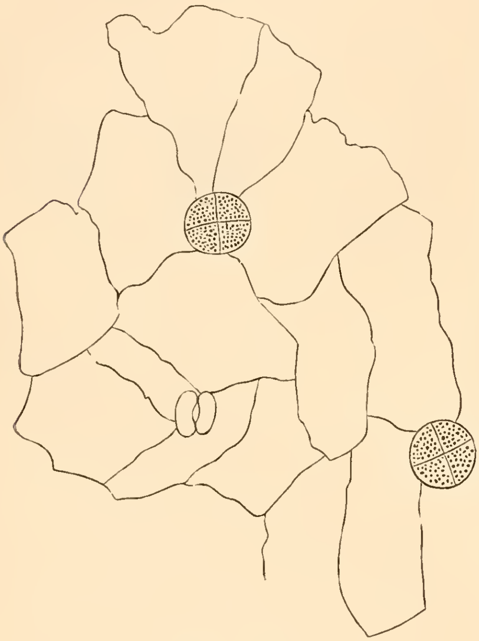


Fig. 133.—× 260.

ready to repeat its function, or, in other words, to begin another meal.

The glands on the under side of the leaves are about half the size of the smallest of those on the upper side, but together with their pedicels present the same form. They consist of four cells only; are more sparsely scattered over the cuticle, and are interspersed with stomata (Fig. 133).

The measurements are approximate.

If of any assistance to readers interested in this kind of work, it may be stated that it is necessary to take both vertical and horizontal sections of the leaf, also to scrape off some of the bodies with a sharp blade and to examine in water to prevent shrinkage.

W. P. HAMILTON.

Shrewsbury.

A DAY WITH THE WOOLHOPE CLUB.

By Dr. A. J. H. Crespi.

TUESDAY, June 24th, was very fine; we started from Barr's Court, and formed a goodly company of hard-working naturalists intent on doing a pleasant day's work. The Woolhope does not encourage ladies except once a year, so that the ordinary field-days are restricted to gentlemen.

From Barr's Court we made our way past Dinmore, which the Club explored last October at its Fungus foray, to the pretty little town of Leominster, charmingly situated in a very picturesque part of Herefordshire, and surrounded by many objects and places of the greatest interest to the antiquary and the naturalist. The town is prosperous and well laid out, with several new terraces, showing that though the population may not be actually increasing, though probably it is, Leominster is spreading itself out over a wider area. This part of Herefordshire is remarkable for the number of handsome, well-preserved, half-timbered houses—a notable feature in the landscape, and particularly striking to members from districts where similar houses are entirely unknown.

Leaving Leominster by Grinhall Lane, the Club made its way to Cursneh Camp, a position from which, as also from Eyton Hill, the Yorkists were driven by their rivals just before the decisive Battle of Mortimer's Cross. I do not know that Cursneh Camp is very remarkable for size or situation, nor is it very perfect; but to every historical student it is deeply interesting from its connection with memorable events in the history of the land. The Camp is picturesquely situated on a bold bluff, while the view across the Valley of the Lugg is striking from the fertility of the country and the air of prosperity in spite of agricultural depression. From Cursneh the members drove rapidly to Kingsland, a large village noteworthy for its splendid church, and deserving of respectful attention on that account. The peculiar feature of the church to the antiquary, who is less impressed by mere size and reverent preservation than the more vulgar sight-seer, is the Volkre Chamber, a curious room of small size opening out of the north-west porch, with a window giving a view of the interior. This chamber from its comparatively small size would not attract the attention of the ordinary visitor; but the Rev. Joseph Barker, of Christ College, Cambridge, Vicar of Eardisland, read a most able and suggestive paper upon it, in which he contended that it was a Sepulchre Chamber, in which certain religious rites were celebrated at Easter time. Fifty other similar chambers, though mostly far less beautiful and perfect, are still in existence in the district. Mr. Barker's suggestion was, however, not accepted by all the members present, and hints were dropped that it was a leper chapel. However that be, it is a notable feature in a church not less remarkable for its noble proportions than for its careful preservation. Leaving the church the party proceeded to a huge wooded mound or tumulus, not far from the west end, and between it and the parsonage. This tumulus, which was once moated, is, according to conjecture, the burial-place of King Merwald, founder of the Convent of Nuns at Leominster, and father of Melburga, who founded Wenlock Priory. Making its way along a fine birch avenue, the Club visited the house of Dr. Williams, and inspected a noble collection of birds' eggs—an instance of what a busy village surgeon can accomplish in spite of the distractions and seclusion of rural practice. At the back of the doctor's house there is a large tithe-barn of some antiquarian interest.

The village was next traversed, the party assembling at the pedestal memorial of the great Battle of Kingsland Field, which once more put the fortunes of the House of York in the ascendant, and placed Edward IV. on the throne.

Making a sharp turn to the left, the party skirted the village, passing many handsome half-timbered houses, and under the guidance of Mr. Barker, a pattern country clergyman, proceeded to Eardisland, where the house in which he lives was inspected, and a more curious specimen of fourteenth-century work could not easily be found. The church, an ancient building reverently kept, was next visited, and a huge moated wooded mound adjoining; this mound is of enormous size and in excellent preservation. The pigeon house, a splendid building, was not forgotten; the village whipping post, another small mound in Monks' meadow, and the Arrow, or Blue river, also came in for some discussion. Among the archæological treasures of Eardisland was a curious carved piece of bone, somewhat in the shape of a cross, eight inches by four or five, rudely fashioned and obviously of great antiquity; it had been found in the neighbourhood.

Burton Court, on the site of an ancient camp, was next visited, and the handsome entrance hall was inspected, while the noble oaks, singularly well grown and symmetrical, which make this part of Herefordshire a paradise to the lover of fine timber, were not neglected. Some of these trees are perfectly majestic in size, and are conspicuous objects in the landscape. One, not far from the Court, is as grand a tree as I ever remember seeing.

The next halting-place was Stretford, where the vicar received the party, and described the ancient church — small and rude certainly, but singular from the presumption that it was a double church dedicated to two patron twin saints, their supposed burial place being between what probably were the halves. The conjectures of ecclesiologists are so various and ingenious that it was not surprising that some of the members of the Woolhope offered daring guesses as to the foundation and original plan of the church; these guesses having the not uncommon merit of showing that, in default of accurate knowledge, there are hardly any lengths to which the intellect of the initiated will not take them.

From Stretford, hidden away in rural solitudes rarely disturbed by the foot of man, the party went to Monkland, for so many years the residence of Sir Henry Baker, the beloved editor of "Hymns Ancient and Modern"; the church is handsome and well kept, and has a good organ. The neighbourhood is noteworthy for buildings of great antiquity, now used for purposes not identical with their original intention. Having done a creditable amount of exploration the Club now returned to Leominster, and was sumptuously regaled at the Royal Oak Hotel with a meal not less remarkable for its abundance than its moderate price. But I must congratulate the Club on the great economy which distinguishes it. After dinner, time still remained for an inspection of the glorious church of the town, singular for its colossal size and for consisting of two buildings of widely different ages and styles: the north part is a vast Norman church in excellent preservation, the south a huge decorated church standing side by side with the former. These two churches are now used as a single church of dimensions so large that few preachers could hope to make themselves distinctly heard without almost superhuman efforts; while, were all the grown-up inhabitants of the town to attend at the same time there would still seem to be room to spare. In my visit to the church I had the signal advantage of being accompanied by Father Rogers, a Confrater of the English Benedictines, and though up to that morning an entire stranger to me even by name, I soon felt closely drawn to him. He is a person of such culture and ripe attainments that it was not unnatural that I should conjecture that his earlier years had been passed at one of our great public schools and ancient universities, and that he had once been in the English Church. This is mere conjecture on my part; but, whether right or wrong, it was a great treat to meet with a man so vastly superior to ordinary mortals, and with manners so well bred and highly cultured. Father Rogers showed me the far-reaching remains of the ancient sanctuary of the priory church: the latter, when connected with the rest of the building and in perfect preservation, must have been one of the most stupendous churches in the kingdom, larger than many of the cathedrals, and only surpassed by a few of the most stupendous.

But to all earthly pleasures there is an end, and when at the station I wished the learned Benedictine farewell, I could not but feel that I had passed a day not soon to be forgotten, and not marred, like too many excursions, by cloudy skies and inclement winds. I hurried to Hereford, and thence to Ledbury, and before midnight found myself standing near the church at Eastnor, also connected for so many years with "Hymns Ancient and Modern" in the person of the present venerable rector, so long the indefatigable Chairman of the Publication Committee.

I do not know that there was anything very remarkable in the day's expedition beyond this—that such gatherings bring people living far apart together, and opportunities are afforded for sharpening one another's wits and for picking up a vast amount of valuable information. The arrangements were made by the excellent honorary secretary, Henry Cecil Moore, of Hereford. It is to the same patient and skilful hand that the Club owes the editing of the last excellent volume of "Transactions," which has recently been published, and which, besides a faithful engraving of the late Dr. Bull of Hereford, so long the life and soul of the society, contains many entertaining and instructive contributions, one especially charming being on the "Tame Hares of Caradoc."

SCIENCE-GOSSIP.

We have received No. 2 of "Le Diatomiste," edited and published by J. Tempère, 168, Rue St. Antoine, Paris. The photo-collotype plates are most excellent, and are fully described in the text.

We have received a copy of Mr. John Hopkinson's highly-suggestive paper "On Local Scientific Investigation in Connection with Committees of the British Association."

Messrs. Geo. L. English & Co., of Philadelphia, send us their extremely interesting priced catalogue of minerals, which not only describes many of the minerals, but also gives illustrations of some of the most important.

A scheme has been started for the formation of a Scientific, Literary, and Arts Club for Bristol and neighbourhood, and has met with much success. Whilst not neglecting the social element, it is purposed to make the institution a local centre for the dissemination of the subjects for which it is founded. The committee include many of the leading scientific men in the West of England. The secretary is Mr. H. A. Francis, F.R.M.S., 14 York Place, Clifton, Bristol. Nearly four hundred names have already been sent in for membership.

The Thirteenth Ordinary Meeting of the Great Yarmouth Natural History Society was held at the Free Library on Wednesday evening, 27th instant, at 8.30 p.m., when a very interesting paper and notes on the Natural History of the District were read by the members.

MICROSCOPY.

Abbe Condenser.—An old friend has lately made me a present of an Abbe condenser. Would some of your readers kindly instruct me as to the best way of using it, and the forms of the best stops? I suppose it wants racking up according to the power of the object-glass. I have an inch, half-inch, sixth, and fifteenth oil immersion lenses. Any hints as to use would be thankfully received.—*Rev. A. C. Smith, 3 Park Crescent, Brighton.*

ZOOLOGY.

Helix nemoralis and hortensis.—May I ask the various conchological readers of your paper to be so kind as to forward me records of their finds of these shells? What I want specially for them to note to me are as follows. What are the colour-variations (with band-formulæ) of these two species that they have found? What number of each variety and band-variation have they found? What are the characters of the soil and herbage? And in each case I want the records from separate and distinct hedges or banks.—*J. W. Williams*, 57 *Corinne Road, Tufnell Park, London, N.*

A white variety of Limnæa glutinosa in Norfolk.—During last year Mr. A. Mayfield sent me a pure white specimen of *L. glutinosa* from Norwich. So long as variety-names stand, and in the event of an albino of this shell not been named before, I propose that the variety-name of albida be given to this form.—*J. W. Williams.*

Helix hortensis, var. trochoidea (Cless.) in Worcestershire.—During my visit to Stourport, in Worcestershire, this year, I found two specimens of this variety near Dunley, with a diameter of 18 mill. I believe this is the first time that this variety has been recorded for Britain. Since finding them, Mr. Robert Wigglesworth writes me that he has found a specimen corresponding to the same variety at Clayton-le-Moors, near Accrington. That gentleman suggested that the variety name of pyramidalis might be given them, but on returning to town I found that Clessin had described them under the name of Trochoidea, and this latter name must therefore stand. Clessin gives the diameter as ranging from 17 to 19 mill. Mr. Wigglesworth's specimen, however, has a diameter of 20 mill., and is therefore a little larger than the specimens from which Clessin described the variety. This does not make much difference, as the trochoid character of the shell determines the variety, and not, in this case, any special measurement. The variety corresponds in hortensis to what Jenner's var. conoidea does in nemoralis.—*J. W. Williams.*

THE COLOURING AND BANDING OF FRESHWATER SHELLS: A REPLY.—In the August number of SCIENCE-GOSSIP Mr. Williams very kindly opens the discussion on the above subject, so I will venture to continue it, as there are several points in his paper which hardly agree with the facts. Mr. Williams confesses to "some small amount of compunction," because his theory is opposed to the views of most conchologists; but, judging from the frequency of his writings, the quantity of compunction must be very small indeed. The following sentence, which I quote, may be very poetical, but it is certainly not very lucid:—"While what I believe nature has been telling us all along is that evolution of all kinds—the shell-colour as well as the mammal from the simple protoplast—has differentiated along a line the polar opposite of that—from the simple to the complex." For instance, does the author intend us to understand that shell-colour resembles a mammal in being derived from simple protoplast? And again, to say that evolution or anything else can be differentiated along a line the polar opposite of another line, is hardly geometrical. We will now discuss the facts (?) which support Mr. W.'s theory, in the order in which he has placed them. (1 and 2.) The "horn-coloured plug" of the embryo and the secondary shell are in a great measure composed of conchyolin (not chitin), a substance which is always naturally horn-coloured, so it seems hardly fair to adduce the colour of these structures as an argument in favour of his theory. Of course, in the adult shell the original colour is marked by the secretion of calcic carbonate and various pigments, but if the shell is decalcified the horn-coloured conchyolin framework will alone remain. (3.) One must conclude that the author means the majority of freshwater shells with which he is acquainted, when he says that "The majority of freshwater shells are horn-coloured and bandless." How about the genera paludina, ampullaria, lanistes, neritina, &c.? and how can "environmental conditions" be less in water than on land? (4.) "An advance in colour is often seen by the development of white flammules." Now, flammule means "a little flame," and conchological science as it stands as present does not recognize flames, either large or small, as part of the ornamentation of shells. If he had said "white flame-like spots," there would have been less to find fault with. (5.) The nucleus of the shell is not "always white, whitish, or horn-coloured," as, for instance, in most specimens of the section of Helix to which *H. pisana*, *virgata*, *maritima*, *explanata*, *pyramidata*, &c., belong. (6.) This paragraph seems intended to prove that albinism was the primitive condition of freshwater shells. (7.) How does Mr. Williams know that *Cyclostoma elegans*, "being a pneumochlamyd, is an example of a freshwater form which has adapted itself to live on land?" Is it not rather descended from marine ancestors? (9.) To say "that considering progression has been from the simple to the complex, is *primâ facie* evidence that bands first were points which afterwards coalesced," is a slight stretch of the imagination, and the few facts which Mr. J. W. W. gives in support of his theory might just as well be made to work the other way, and prove that coloured spots were formed by the splitting up of bands. (10.) Illustrates the author's misconception as to what "environmental conditions" really are. (11.) Does Mr. W. intend us to suppose that the hyalinicæ are inconspicuously coloured in consequence of their supposed immunity from the attacks of enemies? By the bye, is he sure that they really are more free from destruction than other helicidæ?—*S. Pace.*

SAND-GROUSE IN SUFFOLK.—Another flock of sand-grouse were seen on the 7th of August at Thorpe, near Aldborough, by Mr. Alexander, the father of the Mr. Alexander who saw the flock in May last. There were eight or nine birds in the flock, they were flying in a southerly direction, at a short distance from the shore. It is very interesting to find that these birds have not altogether left this country as some persons suppose.—*Edward Neave.*

THE AMERICAN ARION.—Can anyone inform me whether, or where, the Massachusetts *Arion fuscus* has been re-named by any European author? In SCIENCE-GOSSIP for December, 1889, p. 280, I stated, on Mr. Binney's authority, that Bourguignat had described it as a new species; but I cannot find the publication in which he wrote about it. I asked M. Bourguignat himself, but he writes that he has published in several of his works on European species of arion, but does not remember to have yet written on a species of the American Continent (*in litt.* 4th September, 1890).—*T. D. A. Cockerell*, 3 *Fairfax Road*, *Bedford Park*, *Chiswick.*

THE SMALLER-END COLOURING OF EGGS.—In the December number of this journal I stated that the smaller-end colouring did not appear amongst the eggs of the gull, terns, &c., and birds which lay large eggs, and I guarded this statement by saying that the facts and figures I have given are from clutches in my own collection. Mr. Wheldon, in his letter in the February number of this journal, says: "But it is certain that this phenomenon does appear, and that not unfrequently." When I read this I thought—although with all due respect for Mr. Wheldon's statement—that my intimacy with these eggs was not of such a slight character that I should have overlooked this phenomenon if of frequent occurrence, so I wrote to several dealers and others, who have the opportunity of seeing large numbers of these eggs, for specimens, and also for information. The result has been that I have received one specimen only, and that from the well-known naturalist of Tenby, Mr. C. Jeffery. He writes as follows:—"I have had in this season between 1000 and 1100 guillemot eggs, and about 500 razorbills' eggs; the egg I now send you is the only one of the lot marked at the smaller end." He also says: "If I meet with any more specimens I will let you know." The season being now quite over, and not having heard anything more from Mr. Jeffery, and likewise nothing from those to whom I wrote, it may be fairly considered that this phenomenon is very far from being of frequent occurrence. The eggs of the falconidæ and the corvidæ showed the smaller-end marking as freely as in previous seasons. I also noticed it, although sparingly, in the eggs of some of the warblers. I thought, perhaps, the displacement of the folliculus aëris might have something to do with it, but after patient search I found but one egg with the air cell in the small end, and that not a smaller-end marked one. This egg was one of three of the yellow bunting; they are all of rather abnormal shape, being very short and pointed. —*Joseph P. Nunn, Royston.*

BOTANY.

Botanical Vandalism.—M. Correvon, President of the Association for the Protection of Plants, Geneva, writes as follows:—"Les numéros 303, 304 et 305 du Hardwicke's Science-Gossip contiennent de fort intéressants articles au sujet de la disparition de certaines plantes par suite du Vandalisme de certains botanistes ou amateurs. Les mêmes faits ont été signalés en Suisse depuis quelques années, et nous avons fondé en 1883 une association qui compte plus de 600 membres à l'heure qu'il est, parmi lesquels plus de 200 Anglais, dans le but de protester contre la destruction des plantes rares et d'entraver, si possible, le mal. Il est à tout jamais regrettable de constater que les plantes les plus intéressantes de notre pays, les espèces endémiques, filles de notre sol, qu'on ne retrouve nulle part ailleurs, sont ainsi pourchassées dans le but unique d'enrichir des collections. Beaucoup de cultivateurs de plantes arrachent 20 pieds d'une seule espèce et ne réussissent pas à en faire reprendre un seul. Il en est d'autres qui font arracher par des enfants, des bergers, par centaines et par milliers des plantes telles que: *Senecio uniflorus*, *Artemisia valeriaca*, *Crepis jubata*, *Androsace Charpentieri*, les plantes d'entre les plus rares de la chaîne des Alpes, dans un but essentiellement mercantile. Notre Association a cherché à guérir homœopathiquement, le mal par le mal, en provoquant la fondation d'un Jardin alpin d'acclimatation, à la tête duquel se trouve un comité spécial, et qui fait le commerce de toutes ces plantes mais les élève toutes par le moyen du semis. Ce Jardin publie deux catalogues, l'un de graines, l'autre de plantes, et les adresse gratuitement à toutes les personnes qui lui en font la demande. S'adresser pour celà au directeur du Jardin, 2 Chemin Daucet à Plainpalais, Genève. Notre Association publie un Bulletin annuel qui est distribué aux membres et signale tous les dégâts qui parviennent à la connaissance du comité, ainsi que les pertes qu'éprouve annuellement la flore Européenne et en particulier la flore de la Suisse. Notre Association est internationale, et pour en faire partie il suffit de payer 2 francs par année. En outre nous nous efforçons d'enrayer le mal en nous adressant soit aux autorités, soit aux propriétaires que nous invitons à veiller sur les plantes recherchées; ou bien nous intervenons auprès des destructeurs eux-mêmes et nous leur faisons comprendre l'intérêt qu'il y a de conserver des espèces qui s'éteignent. Nous avons donc été extrêmement heureux de trouver dans votre intéressant journal des renseignements propres à nous encourager en nous montrant que chez vous aussi il y a des hommes énergiques qui veulent réagir contre l'œuvre de destruction qui se poursuit malheureusement partout. L'Association pour la Protection des Plantes voudrait pouvoir réussir toutes les données qui se publient sur la disparition des espèces afin de les publier, et nous serons heureux de voir des faits semblables signalés dans votre journal afin d'en tenir compte nous-mêmes. Vos lecteurs ignorent probablement encore qu'il vient de se fonder dans les Alpes du Valais, à Bourg St.-Pierre, sur la route du Grand St.-Bernard, à 1690 mètres d'altitude, un Jardin botanique alpin, dit 'protecteur;' c. a. d. dont le but est, tout en recevant les plantes de toutes les régions nivales du globe, de cultiver et de conserver les espèces menacées de destruction. Ce Jardin porte le nom de 'Jardin botanique alpin de la Linnæa.' Tous les amateurs de la nature voudront le visiter et ils feront bien. Je conclus en priant vos lecteurs de bien vouloir, autant que faire se pourra, signaler les actes de Vandalisme dont ils sont témoins, soit dans les colonnes même de votre Journal, soit en me les adressant à Genève."

Geranium Molle.—At Costessy, near Norwich, there is a large area in which the usual form of this plant is that bearing white flowers. On the borders of this district the flowers of the same are of a very light pink colour. I think this points to the fact that it is the absence of something from the soil, that, in this case at least, has produced an alteration in the colour of the flower.—*Arthur Mayfield.*

Rue-Leaved Saxifrage.—For two or three years I have noticed growing upon a low hedge-bank at Bowthorpe, near Norwich, a curious patch of this plant, in which the divided leaves are seldon developed, the only foliage of the plants being, in the majority of cases, the entire bracts. Upon an old wall about a mile from the spot the plant grows to ordinary perfection. Has any reader of Science-Gossip noticed a similiar occurrence?—*Arthur Mayfield.*

THE CHEDDAR-PINK.—Mr. G. C. Williams writes in the "West Surrey Times" concerning this and other pinks as follows: "It is with much pleasure that we mention a botanical discovery of quite unusual interest. A correspondent, who is an enthusiastic botanist, has at last, after careful and most diligent search, found upon the limestone close to Guildford that very beautiful plant the Cheddar pink (*Dianthus cæsius*). A discovery of this character is worth chronicling in our columns, as few plants are of greater rarity in Great Britain than this one. Wild horses shall not tear from us the secret of its habitat, nor any clue as to the same; but this we will say, that it is not now in flower, the one flower, which was sent by our correspondent, having now withered, and that therefore search for it will be a task of great difficulty. It is found in a very out-of-the-way place, and its home is well-hidden. . . . Lovers of nature in Guildford may now congratulate themselves upon the fact that the plant has another home, and that, if as cruelly evicted as an Irish tenant from its mountain-home, we in Surrey have yet offered to the exile foothold and kindly protection in the midst of our lovely country. Previous to this time but three species out of the five British ones of this family were known in Surrey. The pheasant-eye pink (*Dianthus plumarius*) is found, as far as we know, but in one solitary place, where, during last month, amid the stones of a wall, we saw it in flower. The Deptford pink (*Dianthus armeria*) is almost equally rare. In the neighbourhood of St. Martha's, near Albury, and in a wood near Godalming it is found, as also near Croydon, and, curiously enough, close to where plumarius is found there is a solitary plant of armeria. The maiden pink (*Dianthus deltoides*), we have not found in the immediate neighbourhood, but near Richmond and Ham it is sparingly found. There are three species more of this beautiful family of plants: *Dianthus carophyllus*, the clove or carnation, the parent of the garden varieties, which is scarcely an indigenous plant, and *Dianthus prolifer*, the proliferous pink, which we have never seen in this neighbourhood. The Cheddar pink, the parent of a family in which all are rare, and each exquisitely beautiful, completes our list; and if our column has done no more than to set at rest the vexed question of the habitat of this plant, and to announce the acquisition by Guildford of so rare a treasure, it will at least have had its value to the natural history of the county."

FLORA OF GUERNSEY.—Having informed Mr. Marquand privately of the locality of the supposed Mimulus, he could not find it, but kindly forwarded me some specimens, which I immediately recognised as an old acquaintance (*Bartzia viscosa*), from which, however, the supposed Mimulus differed materially. Mr. Marquand has since suggested that the plant I saw in 1885 was probably an irregular form of *Bartzia viscosa*, which explanation I readily accept, with thanks for his very courteous communications. —*Norris F. Davey.*

SISYRINCHIUM BROMUNDIANA.—Bentham states that *Sisyrinchium Bromundiana* occurs "in Britain only near Woodford, County Galway, in Ireland." It may be worthy of record that a few days ago I found a single specimen on Ross Island near Killarney, County Kerry. Near Glengariff I found several specimens of *Bartsia viscosa.—Thomas J. Slatter.*

HAWTHORN IN FLOWER.—I beg to report some facts incidental to a botanical curio which perhaps may be as surprising, of a second growth of flowers of *Cratægus oxyacantha*, or common hawthorn. This plant in season usually flowers in the month of May, and it is somewhat surprising to find it again conspicuous in flower on August 16th on an old fence on Ashton Moss, Ashton-under-Lyne, Lancashire. Hawthorn in bloom in the middle of August, bearing the characteristics and delightful odour it does in early spring, with the exception that the flower stems, or pedicels, were very much shorter, so that consequently its usual corymbose cymes were more of a glomerate character, thus forming a dense ball-like inflorescence of about one-third their ordinary size. The flowers on each cyme were apparently as numerous as generally found. The flowers, as a friend informs me, the boys were gathering eagerly, and this drew his attention to them. He forwarded me a branch, which appeared to be an old portion of the plant, but almost covered with bloom. Not having made much in the growth of new wood, this may be the subsequent cause of its flowering.—*Jos. I. Newton, Ashton-under-Lyne.*

LEMNA MINOR.—I don't know whether you may consider it worth notice, but as I see a correspondent reports finding *Lemna minor* in blossom, I may say I have for the last three summers in succession found in the same spot (but nowhere else) *Lemna gibba* in blossom. I detected it with the eye, but have since mounted some in glycerine jelly, so that I may be able to convince those who are sceptical on the point. Under a two-inch objective both anthers and stigma show up well.—*W. Oswald Wait.*

BOTANICAL MONSTROSITIES, 1890.—Perhaps the following extraordinary forms of plants may interest the readers of "SCIENCE GOSSIP" as supplementary to those already recorded in previous numbers of that interesting periodical. Colour variation, white-flowered, *Lamium purpureum*, *Orchis morio*, *Scabiosa arvensis*, and *Ajuga reptans*. Floral monstrosities: *Primula vulgaris*, with eleven calyx divisions, eleven corolla lobes, eleven stamens, two pistils, and two ovaries with ovules. *Scabiosa arvensis*, with ordinary flower, but having an extra floret in the axil of a leaf-like involucre; this variation does not seem to be uncommon, as I found two or three in 1889, and several this year. *Everlasting pea;* on dissecting a flower of this plant, which was not in any way extraordinary in outward appearance, it was found to contain two pistils. *Digitalis purpurea:* this flower was the bottom one of the raceme, and consisted of calyx ordinary, containing one green abortion very much like the tubular petals of *Helleborus fœtidus*, one large portion of corolla, which might stand for the lip of an ordinary flower, of usual colour, but having a ragged, green, leaf-like margin, and containing four stamens upon its inner surface; one smaller piece, which might correspond to the other part, when united in the usual bell and not split as in this specimen. The calyx also contained a perfect axiliary peduncle bearing apparently perfect flower-buds as usually occur at the base of the terminal inflorescence. Fasciations: *Polyanthus*, peduncle about three-eighths inch wide, with between forty and fifty pedicels bearing flowers. *Chrysanthemum leucanthemum*, peduncle bearing two flower-buds. *Scabiosa arvensis*, first internode, ordinary; second, three stems united by their inner edges; third, of two stems also united; fourth, ordinary with flower at apex. *Dipsacus fullonum:* this variety seems to be always more or less in the habit of sporting, and I have found this year several different forms, one in which the usual involucral bracts were changed into leaves, containing besides the usual-sized head four smaller ones, also a fasciated stem with two heads joined in one.—*Edwin E. Turner*, *Coggeshall*, *Essex*.

GEOLOGY, &c.

TEIGNMOUTH PEBBLES: WHENCE DO THEY COME? OF WHAT ARE THEY COMPOSED.—Our rocks are coloured by red oxide of iron. Near Brixham and Berry Head, a few miles away, there are iron-mines in the red rocks, close to the sea. Our beautiful coral madrepores and spongy pebbles are more or less coloured through, or in their centres, by the colour of the rock in which they are imbedded, and when polished, it gives them that lovely and striking appearance so admired by collectors. What is most singular, many after being polished a day or two, the corals and spongy-forms, begin to show so distinct that you cannot but admire their beautiful structure. The very valuable ones are now scarce, but a great many varieties are to be found at the "Parson and Clerk" Rocks, and on all the Beaches, from the Ness Rocks to Babbacombe Beach. There is also a wonderful variety of mineral rock in our "Trias," as quartz royalites, quartzites, conglomerates, felsite, nail-headed quartz, granites, various porphyries, and murchisonites. A great many of these metamorphic pebbles were picked by the ice during the glacial period, while snow and ice covered the land. Icebergs freighted with rocks from other lands flowed along our shores, and dropped their burden of foreign stones down to sea-bottom, which forms such a deposit as we have in our rocks, and being denuded by marine currents, might well yield us such a variety of pebbles as we find on our beach. The exact age of our rocks and beach pebbles is not yet made out. The subject offers an interesting study to the geologist. Our own surmise is that there must be veins of the various kinds of minerals which form pebbles on our coast. I have myself discovered several veins where many of the minerals come from, not many miles away, also where many of the corals and spongy-forms are to be found, the same in form as those from our Trias red conglomerate rocks found as pebbles. I have found the stromatoporas of spongy-forms at the Bishopsteignton Quarries, also distinct ones at a quarry at Kingsteignton. The quartz royalites, murchisonites and quartzites are to be found right away to the Haldon Hills. The black porphyries called "Black Jack" are found in abundance on the Carew estate at Hackham, the feather madrepore (*Favosites cervicornis*) at White Rock, Bradley Woods, in abundance; the bird's-eye madrepore (*Amphipora ramosa*) at the same place, and in a quarry at Kingsteignton, where there are fine blocks quarried out of the same. The angle star coral (*Cyathophyllum hexagonum*) and *Heliolites perosa*, *Smithia bowerbanki*, *Acervularia limitata* and *pentagona* are found at Ramsley and Wolborough quarries, and places I could mention where there is a great deposit of stone, such as some of the pebbles found on our beach.—*A. J. R. Sclater*, *M.C.S.*, *Bank Street*, *Teignmouth*.

LIVERPOOL GEOLOGICAL SOCIETY.—The last number of the "Proceedings of the Liverpool Geological Society" contains the following papers: "Life of the English Trias" (Presidential Address), by H. C. Beasley; "What Becomes of the Water Ejected from Volcanoes," by the same; "Geological Notes on an Excursion to Anglesey"; "Note on a Boulder met with in driving a Sewer-Heading in Liverpool," and "Note on Some Mammalian Bones found in the blue clay below the peat-and-forest bed at the Alt Mouth," all by T. Mellard Reade; "Notes of Glacial Moraines," by L. Cumming; "Remarks on the Contorted Schists of Anglesey," by Dr. C. Ricketts; "Notes of Examination of Water and Sediment from the River Arveiron, near Argentiere," by E. Dixon and P. Holland; "Note on the Examination of Some Anglesey Rocks," by the same; "Recent Discovery of a Bone Cave at Deep Dale, near Buxton," by J. J. Fitzpatrick.

THE ORIGIN OF GOLD.—Professor Lobley read an interesting paper on this subject before the Geological Section of the British Association. He showed, from facts recently made known, that while geological evidence is against its igneous origin, all the gold of all the rocks may have been derived from aqueous deposition; that, in fact, all this gold may have been deposited by marine action in the same way as the materials of the aqueous rocks themselves have been. And, moreover, our unaltered sedimentary rocks, even of tertiary age, may contain an equal amount of gold in proportion to their bulk with that of those altered or metamorphosed Cambrian and Silurian rocks which have hitherto been regarded as the earth's great treasures of the precious metal. The knowledge now possessed of secondary and tertiary auriferous veins in California controverts the Plutonic as well as the palæozoic hypothesis; and the discovery of gold in sea-water, and of its precipitation by organic matter, alters the position of the question from that it occupied in the days of Murchison and Forbes. If gold was originally derived from Plutonic sources it ought to be found among volcanic products which come from the same deep-seated sources, and only differ from Plutonic rocks in being solidified under different conditions. But gold, although a most widely distributed metal, is almost, if not quite, unknown as a product of volcanic regions. This is strongly against its igneous origin, and consequently points to the gold of the palæozoic auriferous veins being derived by removal from sedimentary rocks in which it had been originally deposited. This removal could be effected by chemical combination, solution, infiltration, and segregation. Since silica may combine with gold under heated conditions, and the silicate of gold so formed be soluble in hot water, as is also silica, gold in the form of silicate could be carried by water, heated by deep-seated conditions or by the neighbouring uprise of fused matter, from its original position, and be deposited in veins with silica itself, when subsequent segregation would separate the silica of the silicate of gold and leave it as free gold imbedded in quartz as it is now found. The discovery by Sonstadt of nearly a grain of gold to the ton of sea-water shows that the sea has always held in solution an ample store to give to its sediments the amount of gold they are now found to contain, and Daintree's discovery of the power of organic matter to precipitate gold from a solution of the terchloride explains the deposition of gold from sea-water, since on the sea-bottoms there has always been a large amount of organic matter. Though the gold so deposited would be in infinitesimal proportion to the mass of the marine mineral sediments, it would be aggregated by nuclei of metallic sulphides by which it would be retained until thermal conditions favoured its conversion to a soluble silicate. The sulphide of iron, or pyrites, is known to nearly always contain gold, and hence it is to be concluded that the gold of the sedimentary rocks which have not been subjected to the favouring conditions for its separation and preservation in quartz veins is now in the metallic sulphides these rocks contain. In such rocks as the chalk and the London clay, the amount of pyrites is very great; and the author concluded by giving a rough estimate of what may be the amount of the gold now in the surface-rocks of the south-east of England, from which it appears that these deposits may contain gold to the value of £100,000,000 sterling.

FOSSIL HORNED LIZARDS.—At the recent meeting of the British Association, Professor Marsh, of the United States, gave an interesting account of his discoveries with regard to the gigantic *Ceratopsidæ* or horned dinosaurs. During the last two years Professor Marsh has been working at certain beds called Laramie, near the Rocky Mountains. The true character of these beds was formerly doubtful, but it has now been found by examination of the flora that the lower part is true cretaceous, and that the upper part is tertiary. In the true cretaceous these Saurian remains have been discovered. They are of great size, and the blocks in which they are embedded sometimes weigh as much as two tons. Securing them has been a work of great difficulty, and called for the exercise of much engineering skill. The remains, diagrams of which were exhibited, differ from those most familiar to European workers. The skull is of great size, and is characterised by two large horn cores near the eyes, and by one smaller horn core on the nose like that of the rhinoceros, extending a considerable way backwards, where it appears to be armed by rudimentary cores. The teeth also are peculiar in having fangs implanted crosswise in the adult. The length of the skull is quite 8 ft.; the brain is relatively very small. To bear this enormous weight there are peculiar modifications of the neck, vertebræ, and of the four limbs. Professor Marsh was disposed to refer this *Ceratopside* to a distinct order of the dinosaurs.

EARTH MOVEMENTS IN PRE-CAMBRIAN AND PALÆOZOIC TIMES.—Dr. Henry Hicks, F.R.S., F.C.S., read a paper, in the Geological Section, on "The Effects produced by Earth-Movements on Pre-Cambrian and Lower Palæozoic Rocks in some Sections in Wales and Shropshire." He gave examples to show the powerful influences exerted by earth-movements in producing changes in the rocks, and in obliterating the evidences of succession in the disturbed areas in Wales and Shropshire. He pointed out that the difficulties experienced by geologists who examine these areas for the first time are mainly due to their being unable, or unwilling, to recognise the extraordinary effects produced by these earth-movements, and especially the complications due to faults and thrusts. Frequently portions of the pre-Cambrian rocks have been forced in among the Lower Palæozoic rocks so as to appear either to be parts of the series or to be intruded into it. In other places they have been made to appear to overlie much newer beds. A section across the St. David's promontory shows an arch of Cambrian rocks, and of Arenig beds containing great masses of igneous rocks, probably portions of sheets in the forms of Laccolites, all bent over a core of pre-Cambrian rocks, and repeatedly broken on the west side by thrust-movements, causing newer beds to be driven over beds of various horizons, in some cases many thousands of feet apart in the succession; whilst on the east side the limb is broken by reversed faults, so as to make the beds appear to dip under the pre-Cambrian rocks. Again, in the pre-Cambrian core itself the Pebidian rocks are not only sheared to an enormous extent, but are also made, on the south side, by reversed faults, to appear to lie under parts of the granitoid rocks (Dimetian); one result of these mechanical movements being to make the Dimetian look as if intruded into the Pebidian beds, whilst in reality it is everywhere here bounded by faults, as the result of repeated earth-movements in pre-Cambrian and subsequent periods. The author also showed that very similar results have taken place in the sections between the Menai Straits and the Snowdon district, where not only do the Cambrian rocks appear to underlie the pre-Cambrian, but at one point even Arenig beds are made to dip under both. The author stated that in a section in Shropshire, extending from the Longmynd across Caer Caradoc, Lower Palæozoic rocks are faulted so as to appear to underlie the pre-Cambrian rocks of Caer Caradoc; whilst on the east of Caer Caradoc, as the result of thrust-movements, great thicknesses of the lower beds have been hidden by much newer ones. He mentioned that the changes which have been produced in the rocks themselves are also very marked. The granitoid rocks give evidence of having been greatly crushed by the earth-movements in pre-Cambrian times, and in the lines of fracture secondary minerals have been freely deposited. That these secondary minerals date back to pre-Cambrian times is shown by the fact that the pebbles of these granitoid rocks in the Cambrian conglomerates contain all the evidences of the early crush with secondary minerals in the crush-lines, in addition to those of subsequent fracture and deformation by pressure after they had been entombed in the conglomerates. Some of the felstones in pre-Cambrian times were crushed so that they were formed into felsitic schists, and fragments of these schists occur frequently in the Cambrian conglomerates. Various dykes in the pre-Cambrian rocks exhibit indications of having suffered greatly from mechanical pressure in pre-Cambrian times, the diabase dykes in the Dimetian being frequently cleaved so as to look almost like slates. Fragments of these, and of many other cleaved and altered rocks, occur frequently in the Cambrian conglomerates. In the Cambrian and Ordovician rocks the evidences of pressure during subsequent earth-movements are also abundant, and secondary minerals have been freely developed along planes of cleavage, and in lines of fracture. The effects on some of these rocks near thrust-planes are well exemplified by the remarkably distorted condition of some of the fossils. In Tremadoc beds, near St. David's, an *orthis*, which in its normal condition was about seven lines in width, was so distorted that it measured over twenty-seven lines, and others were still further drawn out so as to be almost unrecognizable.

NOTES AND QUERIES.

THE FOOD OF BIRDS.—Mr. Macpherson's notes on the food of birds is very interesting. As to the bull-finch, if any one will examine one internally at the time when the gooseberry is in bud, he will find that it is partial not only to insects frequenting the bushes but to the buds themselves.

BLACK MUSTARD.—Last week I was at Torquay, and noticed how fond linnets are of the seeds of the black mustard (*Sinapis nigra.*) One would have thought that they would have been too warm, but they seem as fond of them as chaffinches are of radish seed.—*F. H. Arnold.*

TENACITY OF LIFE IN A CAT.—A very severe accident to a cat came under my notice about two years ago. The cat was in the habit of catching mice under a machine for lowering casks into a brewery cellar. One evening it was working and the first hogshead of ale was rolled on and lowered, when it reached the bottom, the screams of an animal attracted the attention of the man: he looked, and found the cat was trapped between the edge of the cage and the floor. She was caught across the loins and had to remain in that position until he called another man to help him upend the hogshead. If he had rolled it off, it would have smashed the cat to atoms, as its weight was about six cwt. When the cat was released she crawled away and they could not find her again that night. Next morning she was found in the cellar alive, and brought up to me. I examined her, and could not find any bones broken, but she could hardly move. I decided not to kill her, but try and bring her round, so made a bed in a warm corner of the engine-room; she lay there for three or four days in a very weak and bad state; in about a week she had three dead kittens, and then began to recover rapidly. For a few weeks she could only limp a short distance from her bed. She is still alive, and no one would notice by her appearance that she had ever been so badly hurt, since that time she has had about eight kittens. She is very quick in all her movements, and a very keen mouser. When I read the note on the same subject in SCIENCE GOSSIP for July, I thought the above might interest some of your readers.—*Jno. E. Nowers, Burton-on-Trent.*

REDSTARTS IN WINTER.—The bird in question is evidently a redstart, and is identical with the female redstart that is familiar to us in our gardens during the summer months. It is preserved and can be seen. I could not think of the black redstart, when that bird is recorded to have only visited the shores of Britain about half a dozen times. The locality is

Brackley, on the outside of Northants, bordering on the counties of Bucks and Oxfordshire.—*H. Blaby.*

MORE VARIATIONS.—I have a milk-white specimen of the field-mouse (*Arvicola arvensis*), caught in the hay field a few days ago. This, I think, is a curiosity. Although I have caught scores of these animals when rambling about the fields, I never saw or heard of a white one before.—*H. Blaby, Brackley, Northants.*

TRUMPET-FISH.—I have a son a sailor, and he brings me home shells. He was lately in Java, and he was much interested in a fish which made a noise like a trumpet. He heard it only at one place, Sourabeya, in Java. Other sailors told him they never heard it anywhere else. Perhaps some of your scientific contributors may be able to tell us something about it.—*Janet Carphin.*

THE BIRTHPLACE OF THE ELECTRIC TELEGRAPH.—As the writer of the paper bearing this title, and commented on by Mr. Farrant, I should like to say a few words. Your correspondent points out that so early as the middle of the last century discharges of electricity had been sent through wires of considerable length, etc. Ronalds himself, years before he made his telegraph, had often experimented in the same way, as he mentions both in his book and in an unpublished MS. autobiography, now in my possession. The point of importance is this, that although many were on the brink of the discovery, it was reserved for Mr. Ronalds to be the first to practically arrange a method of electric communication by means of dials at any distance, and not to have merely formulated a system of electric intercommunication on paper. He did it first, in 1816, and described it on paper seven years later.—*W. G. Kemp.*

THE SONG-THRUSH.—One of the most useful birds about the garden during the summer months is that early spring musician the song-thrush (*T. musicus*), the throstle and mavis of the poets. From June till August this year the thrush has haunted our little garden, and it has been my pleasure on many occasions to watch its movements when engaged in searching for the big shell snails (*H. aspersa*), which lurk, during the day, in crevices of the walls. When discovered the mollusc was dragged forth, carried to some convenient stone, and there ruthlessly smashed by the bird with repeated strokes. Previous to flying off with its booty to its nest in an adjoining orchard, the bird always rubbed the now shell-less snail in the earth several times in succession; this I imagine was to assure a firmer grip of its slimy prey. We had two or three of these welcome visitants to our garden this summer; and one of them, I regret to say, met with a very sad end. In its persevering search for the snails, it had got its head tightly wedged some distance into the wall, and, being thus unable to extricate itself, had perished miserably. Poor bird! no more shall we hear thy early spring carol from the "windy tall elm tree."—*W. H. Warner, Fyfield, Abingdon.*

NATURAL HISTORY NOTES.

Errata in September number.—White beet should be white bat, and Ardhea should be Ardkea.

A white variety of the linnet was observed in this locality last month.

The radiant form of *Centaurea nigra* grows in this locality.

Montague's "Dictionary of British Birds," edited by H. W. Newman, and Dallas in his "Natural History," assert that the gannet or solan goose is incapable of diving. The editor of "Cassell's Natural History" is correct, as I can bear testimony, as I have remarked gannets plunging down into the sea and being perfectly submerged.—*Rev. S. A. Brenan, Knocknacarry, co. Antrim.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

WE request that all exchanges may be signed with name (or initials) and full address at the end.

SPECIAL NOTE.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

W. D. RAE.—We shall be very pleased to have your paper on the marine conchology of the coast of Aberdeen.

R. A. BULLEN.—The beetles belong to the Brachelytra, family *Homalidæ*. Its scientific name is *Anthobium ophthalmicum*. It is usually taken on umbelliferous plants, and is a common insect.

M. R. Y. (Surbiton).—Do you mean the cardinal grosbeak or the crested tanager? The former is a North American bird.

W. WEAVER.—Your specimens are as follows:—No. 1 is the maple-leaved goosefoot (*Chenopodium hybridum*); rather rare. No. 2 is probably a monstrous form of the deadly nightshade (*Atropa belladonna*), with malformed flowers.

E. M. WESTLEY.—Send us a specimen of the poppy you mention, for identification.

YOUNG GEOLOGIST.—The specimens you sent us are not "travelled fossils," but nodules formed by separation in the clay beds. The flat nodules were formed in a similar manner, but under slightly altered conditions. All are highly calcareous, and the limy matter was probably derived from dissolved shells. Get the geological survey memoir relating to the pleistocene deposits of the great Cheshire plain.

O. CUSTANCE.—The shrub you sent is *Euonymus variegatus*, with a flattened or fasciated stem.

J. BELL.—For the diagrams of coloured edible and poisonous fungi, apply to Messrs. W. H. Allen & Co., Waterloo Place, London.

EXCHANGES.

SCIENCE-GOSSIP for 1884 and 1885, unbound, in exchange for John's "Forest Trees of Britain," 1 vol. edition, or other works on botany or ornithology.—W. H. Warner, Fyfield, Abingdon.

DESIDERATA, British dragonflies and orthoptera, particularly cockroaches, crickets, longhorn grasshoppers and locusts, fresh and unset preferred. Duplicates, British and foreign lepidoptera, dragonflies, and other insects.—Editor, "Naturalists' Gazette," Birmingham.

WANTED, any books on the microscope, also foreign shells in exchange for choice microscopic slides of every description, and rare British marine shells.—R. Suter, 5 Highweek Road, Tottenham, London.

WANTED, one or two dozen common sphinx larvæ. Good exchange given.—C. H. H. Walker, 12 Church Street, Liverpool.

Helix fortunata, cingulata, maderensis, &c., in exchange for foreign land and freshwater shells. Lists exchanged.—Colonel Parry, 18 Hyde Gardens, Eastbourne.

OFFERED, thirty-two photos (5½ by 8 inches, mounted on cards) of views in New Zealand, comprising the Terraces, volcanic and mountainous scenery. Will exchange for dissecting microscope, binocular field-glass of good power, or collection of British shells, minerals, &c.—E. Bostock, Stone, Staffs.

WANTED, good unmounted diatom material, in exchange for mounted diatoms.—Wynne E. Baxter, 170 Church Street, Stoke Newington, N.

WANTED, British marine shells, particularly species of pecten, in exchange for a "Demon" detective camera, with developers and plates.—Chas. Pannell, jun., East Street, Haslemere.

SHELLS.—*Pecten opercularis, P. tigrinus, P. maximus, Arca lactea, Cardium echinatum, Cyprina islandica*, and var. *crassior, Venus exoleta, Scrobularia tenuis, Tectura testudinalis, Trochus tumidus, T. ziziphinus, Trichotropsis borealis, Murex erinaceus, M. aciculatus, Trophon truncatus, Fusus gracilis, F. antiquus, Pleurotoma turricula, Pleurobranchus membraneus*, &c. Wanted, Newman's "Butterflies and Moths," insects, micro-slides, or other shells not in collection, or good books on insects.—W. D. Rae, 9 Claremont Terrace, Alpha Road, Millwall, London.

WANTED, a good egg cabinet to hold not less than 250 varieties. Good exchange offered.—F. Stanley, Margate.

QUANTITY of duplicates in various branches of natural history, British and foreign shells, fossils, and birds' eggs, in exchange for varieties new to collection, or cabinets for eggs or shells.—F. Stanley, Margate.

A COLLECTION of seeds collected by the late Mr. Smith, curator of Kew, 1000 varieties, mounted on cards and arranged in trays in large case, all named, offered in exchange, or part exchange, for a good collection of fossils or shells.—Thos. W. Reader, 171 Hemingford Road, Barnsbury, London, N.

DUPLICATE EGGS.—Kite, sparrow-hawk, owls, redstart, black redstart, blackcap, whitethroat, chiff-chaff, skylark, goldcrest, tree and meadow pipits, wood wren, blue, cole, crested, great, marsh, and long-tailed tits, white wagtail, house and sand-martins, lapwing, sandpiper, barbary partridge, red grouse, black-headed gull, herring gull, eider, guillemot, and many others; all pairs and singles, no clutches. Wanted, herons, bearded tit, wheatear, stonechat, march harrier, dunlin, ruff, whimbrel, night heron, grey-leg goose, garganey, golden-eye, Richardson's skua, and many others.—Hollis, Grantham.

WANTED, animal and vegetable hairs for micro mounting, in exchange for unmounted micro seeds or young cactus plants.—J. T. Holder, 18 Casella Road, Hatcham, S.E.

FINELY preserved sea-urchins (*E. sphæra*), also shells—*Mytilus incurva, pellucida, T. fabula, H. pellucidum, T. testudinalis, H. ulvæ, S. corneum*, var. *pisidoides*, &c., in exchange for shells and lepidoptera.—T. W. Paterson, 59 Hazelbank Terrace, Edinburgh.

OFFERED, L. C., 8th ed.:—40, 45, 76*c*, 78, 95, 98, 121, 165*b*, 187, 191, 213, 254, 291, 306, 311, 335, 336, 364, 403, 494, 557, 585, 656, 701, 713, 754, 776, 830, 898, 957, 935, 1007, 1202, 1217, 1262, 1385, 1468, 1491, 1519, 1537, 1545, 1547, 1571, 1592, 1595, 1630, 1636, 1694. Many desiderata in phanerogams, mosses, and liverworts.—Miss E. Armitage, Dadnor, Ross.

A NUMBER of scientific and other books for exchange; list sent.—B., 66 Gloucester Crescent, Regent's Park, N.W.

JURASSIC fossils, with a few flints, offered for literature on the oolites, or vols. 1 to 5 of the "Entomologist," bound or unbound.—J. A. H., 38 Oak Road, Scarborough.

OFFERED, *Sp. corneum*, vars. *flavescens* and *minor, Sp. lacustre*, var. *Ryckholtii, Pis. fontinalis*, var. *fulchella, Pl. nitidus, Z. excavatus*, &c. Wanted, *H. obvoluta, Cl. biplicata, Cl. rolyphii, H. fusca, H. aculeata, Z. radiatulus, Succ. pfeifferi*.—P. R. Shaw, 48 Bidston Road, Birkenhead.

WANTED, "Band of Mercy," "Animal World," or any illustrated publications on natural history, for micro mounts or foreign material.—M., Ferndale, Brondesbury Road, N.W.

L. C., 8th ed.: 4, 6, 185, 199, 221, 288, 291, 340, 372, 373, 380, 395, 396, 403, 552, 590, 596, 611, 634, 635, 647, 663, 667, 688, 707, 756, 785, 791, 805, 901, 909, 933, 1024, 1029, 1030, 1086, 1089, 1128, 1255, 1354, 1408, 1461, 1642 and 1791, in exchange for good specimens of other British plants.—G. Goode, 3 Tenison Road, Cambridge.

DUPLICATES.—*Unio pictorum, Neritina fluviatilis, Bythinia Leachii, Valvata piscinalis, V. cristata, Planorbis nitidus, P. carinatus, P. corneus, P. contortus, Physa hypnorum, P. fontinalis, Limnea glutinosa, L. stagnalis, Ancylus lacustris, Succinea putris, S. elegans, Helix cantiana, H. virgata, H. ericetorum, Clausilia rugosa, Hydrobia ulva, H. ventrosa*, &c. Desiderata, other shells or natural history specimens.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

I NOTICE in September's number of SCIENCE-GOSSIP, that on the Murray Firth side the town of Cromarty there are good specimens of fossil fishes in the limestone nodules. If any one will send me a small box of them, say ¼ cwt., labelled "rough stones for geological purposes," they will come at a mineral rate. I shall be pleased to send polished Devonian specimens or other fossils in return.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, S. Devon.

OFFERED, Carpenter's "Animal Physiology," and Gosse's "Introduction to Zoology," vol. i. Wanted, anatomical works, specimens for dissection, or microscopical cabinet or apparatus.—W. P. Pycraft, Aylestone Road, Leicester.

WANTED, good cabinet specimens of azurite, bismuth, bronzite, cobalt, hematite, tin ore, magnetic iron ore, obsidian, native copper. Offered, hornblende, jasper, mica, amphibole, jet, crocidolite, blende, rock crystal, &c.—Chas. Wardingley, Blackwood Crescent, Edinburgh.

H. lamellata, P. ringens, An. lacustris, and numerous other shells and fossils, offered for fossils and Continental and foreign Shells.—John Hawell, M.A., Ingleby-Greenhow Vicarage, Northallerton.

GENTLEMAN making a collection of curious forms of flints and other varieties of silica, would be glad to receive donations of same, or offers other mineralogical specimens in exchange.—J. A. Ellis, 1 Pomona Place, Fulham, S.W.

OFFERED, eggs of chough in pairs, clutches of s. hawk, kestrel, dipper, stonechat, grasshopper, warbler, goldcrest, nuthatch, creeper, grey wagtail, twite, corn bunting, bullfinch, oyster-catcher, landrail, m. swan, cormorant, kittiwake, herring gull, lesser b. b. gull; nests with smaller eggs. Eggs of ringed and com. guillemots, razor-bill, puffin, sooty tern, m. shearwater, storm petrel. Wanted, clutches only.—R. J. Ussher, Cappagh, Lismore.

DREDGINGS in great variety, and from various depths, containing foram. shells, will be given in exchange for other dredgings containings molluscan shells.—Mr. Marshall, Sevenoaks, Torquay.

COULD any reader supply me with SCIENCE-GOSSIP for 1881 (bound, or in parts)? I will give a liberal exchange in good carboniferous fossils, or fossils from other formations.—P. J. Roberts, 4 Shepherd Street, Bacup.

WANTED, a secondhand microscope (Watson's Histological preferred), must be in good working order. Offered, 300 species of land, freshwater, and marine shells, European and foreign, or a lot of Maltese miocene fossils, or state requirements.—Jos. S. Galizia, Valetta, Malta.

OFFERED, good microscopic slides in exchange for clean gatherings of volvox.—S. L., c.o. W. West, 15 Horton Lane, Bradford.

WANTED, fossils, foreign shells, minerals, any kind, in exchange for gold ore, several varieties from Brazil.—W. J. Weston, jun., Beckley, Sussex.

I REQUIRE sp. of British shells, land, freshwater and marine, and in exchange I will forward to your address a box containing sp. of N.Z. shells, land, freshwater and marine. Of N.Z. shells I have about 43 distinct species of land shells, about 14 freshwater, and about 260 marine. I have also a large number of South Sea Is. and Australian shells in duplicate. I am opening my private collections as a local museum, and should be glad of anything else of interest in fossils, minerals, geological sp., for which I will do my best to repay you by N.Z. exchanges.—James H. Bettany, Broadway, Marton, New Zealand.

WANTED, good foreign stamps, in small or large lots, at once. Will give in exchange minerals, fossils, natural history specimens, books, &c.—F. Cartwright, 20 Eldon Street, C.-on-M., Manchester.

BOOKS, ETC., RECEIVED.

"Principia; or the Three Octaves of Creation," by Rev. Alfred Kennion, M.A., (London: Elliot Stock).—"Records of the Australian Museum, vol. I., No. 2.," by E. P. Ramsay.—"Principles of Mechanism as applied to the Solar System," "Sap: Does it Rise from the Roots?" by J. A. Reeves, (London: Geo. Kenning).—"On Local Scientific Investigation in Connection with Committees of the British Association," by John Hopkinson.—"An Analysis of Some of the Ocular Symptoms Observed in So-Called General Paresis," by C. A. Oliver, M.D.—"The Natural Food of Man," by Emmet Densmore M.D. (London: Pewtress & Co.).—"Journal of Royal Microscopical Society."—"Le Diatomiste."—"The South-Eastern Naturalist."—"Magazine and Book Review."—American Microscopical Journal."—"American Naturalist." "Canadian Entomologist."—"Insect Life."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope," &c., &c.

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

THE COLOURING AND BANDING IN LAND AND FRESHWATER SHELLS.

By C. CLARE FRYER.

MR. J. W. WILLIAMS' attempt to solve the problem of the origin of the colours in land and freshwater shells seems to us just a little premature. Any theory dealing with their origin and evolution must rest on a good understanding of the relationship between the shell and its environment, the meaning and uses of the colours, their chemical composition and physiological development, as well as their variations, and in all these departments much work remains to be done before we can formulate a good theory as to the origin of colour.

It is a pity, too, seeing how little has been written on the subject by conchologists, that Mr. J. W. Williams does not give the views of those from whom he differs, they would have formed a fitting preface to his article and have enabled us to duly appreciate his original theories.

With the qualification which I have italicised, the statement that "the evolution of colours and bands has *in the main* differentiated along a line from the simple to the complex," is probably more in accordance with the teachings of nature; but so generally does Mr. Williams apply his dictum without the qualification, as to create the impression that *all* the species have evolved along a line, *i.e.*, uninterruptedly and undeviating, in one direction from the simple horn-coloured progenitor to the complex, banded species of to-day, and if this is what he intends to convey, it certainly does not accord with the views of evolution as laid down by Darwin, Wallace, and Spencer, and is, as I hope to show presently, hard to reconcile with the facts; but to proceed with these in their order:—

(1.) The colour of the chitinous plug in the trochosphere stage is due to the very constitution of the conchiolin, not chitin, of which it is composed, and not to pigment cells.

(2 and 5.) The nucleus of the secondary shell is perhaps generally, but certainly not always, white, whitish, or horn-coloured; for instance, it is black in *Helix virgata*, and coloured in several foreign members of the group (*H. syriaca*, *H. maritima*, etc.).

(3.) That the majority of the Limnea are horn-coloured and bandless is true, but the Chilinia are marked with spots and bands, while the colours developed in the Paludinidæ, Neritidæ, Cerithiadæ, etc., present real difficulties to such a view: but perhaps these would all disappear if Mr. Williams would explain what he understands by "environmental conditions," also why they should be less in freshwater than on land.

(4.) It is difficult to see how we may legitimately consider white to be "an advance in colour," since white is not necessarily a pigmentary colour at all, but may be due to the molecular structure of the surface, and at the most can only be akin to pigment, "differing widely from it in optical properties in that no absorption takes place."* Moreover, are we not involving a great deal by selecting an embryological variation of such all pervading occurrence among the distinct classes of animals, and of a nature so little understood, as albinism, for the first advance in shell colour? If we admit that the primitive mollusc was an albino, must we not admit the same of all classes of animals

* "The Colours of Animals," by H. E. Poulton, p. 187.

presenting the phenomenon of atrophy of the pigment glands?

(6.) By-the-bye, *Helix aspersa* var. *exalbida*, can hardly be considered as a reversion to a white or even horn-coloured ancestor, all the specimens I have seen having a distinct tinge of yellow suffused over the shell, while their light appearance seems to be due to the absence of band colour, and the reflection of the white nacreous interior through the yellow pigment.

(7.) The idea that the "pneumo-chlamyd" (*Cyclostoma elegans*) has evolved from a freshwater form, is new to us, and the reasons for the assumption would doubtless be interesting; here again Mr. Williams seems to overlook the fact that many of the tropical Operculata are as brightly and complexly coloured as the Helicidæ.

We now adduce a few facts and arguments to make it clear that the colour of our Hyalinæ is not necessarily due to the persistence of the primitive horn colour, but is more probably due to the suffusion of the darker band colours, as suggested in this magazine by Mr. T. D. A. Cockerell;* also that colour has not always evolved along a course leading from the simple to the complex, and there is strong reason for believing that Mr. J. W. Taylor's supposition "that *Helix cantiana*, *cartusiana*, etc., were once banded species," † is tenable. Few facts, so far as I am aware, have as yet been published in support of these views, and this must serve as my apology for the following:—

(i.) *Helix cantiana*, a horn-coloured variety, often has the five bands distinctly, though faintly developed, and may be more legitimately regarded as a reversion to a banded ancestor, than the occurrence of albino specimens.

(ii.) When the brown colour of *Helix memoralis* is suffused over the shell as in the var. *castanea*, the interspaces between the bands are lightest in colour; one specimen presenting the above features, has the umbilical region clouded with continuous brown; this tendency of the band colour to pervade the umbilical region is noteworthy as it becomes normal in *Helix cantiana*. The interspace between the third and fourth bands is often the lightest part of the shell, forming a marked light band, in some specimens of *H. nemoralis* var. *castanea*, and this is clearly shown in specimens with a band formula (1 2 3)(4 5). Now careful comparison leaves no doubt that the white band developed around the keel of *Helix rufescens*, *H. cantiana*, *H. cartusiana*, *H. concinna*, and *H. hispida* corresponds, not to band No. 3, as I believe is generally supposed, but to the interspace just below it and above band No. 4. This relative position may be exactly determined as band No. 4 is bisected by the suture of the lip in *H. nemoralis*.

* SCIENCE-GOSSIP, January, 1888, p. 20.
† Valedictory address as President of the Conchological Society, 1887, published in "Journal of Conchology," April, 1888.

(iii.) It is now necessary to show that when white is abnormally developed in Helix, it occupies the interspaces, or in other words affects the suffused ground colour. A variety of *Helix hortensis* from Bourne End, Bucks, having white around the sutures, traces of white between the bands (that between Nos. 3 and 4 being most developed), and white continuous over the umbilicus, while the positions occupied by the bands are of a light apple-green tint, admirably illustrates this. Again, fifteen specimens of *Helix lapicida* var. *minor*, from Allport, Derbyshire, are of the suffused dark brown colour. Careful examination reveals the following differentiations possibly bearing on their evolution: Traces of a darker brown band in the position of No. 3 are exhibited by four specimens; seven have traces of No. 4 only; one has, in addition, a thin silvery streak occupying the interspace immediately above the band No. 3; another has a thin streak immediately below band No. 4, while the two other specimens have thin silvery streaks in the same relative positions but no bands.

(iv.) The umbilical regions of *Hyalina cellaria*, *alliaria*, and *nitidula* are often clouded with white, which in some specimens ends off with regularity and sharpness of definition just about the region of the fifth band: this becomes intelligible in the light of the above facts as representing the original ground colour, while the brown corresponds to the suffused bands; and this view receives strong confirmation from the specimen of *Hyalina nitidula* (figured and described by Mr. T. D. A. Cockerell in SCIENCE-GOSSIP, October, 1888, pp. 205–6).

(v.) The explanation given by Mr. Williams of the occurrence of horn-coloured shells in our Hyalinæ is unsatisfactory, because it would be extremely difficult to prove their relative immunity from the attacks of those animals which make snails their food, while it is easy to show that they have many enemies; among which may be enumerated, thrushes, blackbirds, starlings,* shrews,† and probably ants,‡ and if their small size protects them, how much more would the size of *Helix aculeata* and *Helix pygmæa* preclude the necessity of their environmental and protective coloration?

POND-HUNTING.

I HAVE thought it might be interesting to microscopical amateurs who may be readers of your magazine, to know what wide fields of investigation are open even to those whose opportunities for country excursions and pond-hunting are extremely limited, and who, for this reason, may be discouraged from following up this most fascinating branch of study. They may be glad to learn that

* Tate in "Plain and Easy Account of the Mollusca," p. 106.
† SCIENCE-GOSSIP, January, 1884, p. 3.
‡ *Ibid.*, April, 1884.

access to a pond once in six or even in twelve months is quite sufficient to afford material for investigation during the interval. I have two small aquaria of the bell-glass type, the one 10 inches, the other 9 inches in diameter, the former devoted to goldfish, the latter restricted to the more militant stickleback. This I have had in my study for some five months. It contains weed brought from one of the ponds in the grounds of the Crystal Palace—anacharis, myriophyllum, &c., and also some water from the same source. I have been struck with the marvellous variety of infusorial life that can be preserved and propagated in captivity with apparatus so simple, and with no attention beyond that necessary to keep the water to one level, owing to evaporation. After the aquarium had been in working order for four or five weeks, occasional samples of the water showed an unusually large representation of rotatoria, including some of the choicest forms. I took a random dip with a zoophyte trough 2 inches by $\frac{3}{8}$ inch, taking, with the water, a few detached, half-decomposed leaves of myriophyllum, with the following result in rotifers alone: *Floscularia ornata*, *Pterodina patina*, *Furcularia longiseta*, *Dinocharis pocillum*, *Colurus* (?), *Mastigocerca carinata*, *Salpina mucronata* and *brevispina*, *Monostyla cornuta*, *Philodina citrina*, *Notommata aurita*, *lacinulata*, and *tripus*, *Œcistes crystallinus*, *Metopidia solidus*, *Rattulus tigris*, *Euchlanis triquetra*, *Rotifer vulgaris*, *Cathypna luna*, *Brachionus rubens*, *Cephalosiphon limnias*. This was pretty good for one sampling. The next day I took another, and found the following additional forms: *Floscularia campanulata*, *Stephanoceros eichornii*, *Melicerta ringens* and *Tubicolaria* (? tyro), *Proales tigridia*, *Mastigocerca elongata*; and I have since found *Floscularia cornuta*, *F. calva*, *F. longicaudata* (described by Dr. Hudson as "rare"), *F. ambigua*, *Synchæta tremula*, besides others that I have not yet had leisure to identify. My surprise has been excited at finding in captivity forms that I have long sought for in their various habitats in vain. My goldfish aquarium has from time to time yielded me some exceedingly rich treasures, amongst them several varieties indicated as "rare" in the invaluable monograph of Dr. Hudson and Mr. Gosse, *e.g.*, *Floscularia trilobata*, *F. edentata*, *Œcistes serpentinus*, &c.

In the same water I have within the last few days seen the following miscellaneous specimens of pond life: *Canthocamptus minutus*, *Chætonotus larus*, *Vaginicola crystallina*, *V. decumbens*, *Ophrydium sessile*, *Stentor Mulleri*, *S. Barretti*, *Loxophyllum meleagris*, *Lyncæus sphærica*, *Kerona polyporum*, *Halteria grandinella*, *Podophrya mollis*, *Cypris reptans*, *Platycola decumbens*, *Opercularia nutans*, *Hydra vulgaris*, *Stylotricha remex*, *Stylonychia mytilus*, *Anthophysa vegetans*, *Arcella vulgaris*, *A. discoides*, *Salpingœca amphoridium*, *Centropyxis aculeata*, *Vorticella convallaria*, *V. microstoma* (and several other species), *Milnesium tardigradum*, *Anguillula fluvatilis*, *Dero obtusa*, *Actinophrys sol*, *Amœba proteus*, *A. villosa*, *Chætogaster limnæi*, *Difflugia pyriformis*, *Spirostomum ambiguum*, *Saprolegnia*, *Lophopus crystallinus*, &c., besides the common varieties of diatomaceæ, confervæ, &c. These I have catalogued indiscriminately as they came under my notice, and, did time permit, I could, of course, add to the list indefinitely; but the enumeration I have given will show that with a 9-inch bell-glass and a microscope the zoologist has ample scope for exploration. I continually come across numerous species of entomostraca, rhizopoda, &c., not mentioned above, also of planarian and naidian worms. Is there any good monograph on the latter?

JOSEPH HALSEY.

ON THE FOSSILIFEROUS ROCKS AROUND WORCESTER,

As represented by the Specimens in the Local Museum in connection with the Worcester Public Library and Hastings Museum.

By F. T. SPACKMAN.

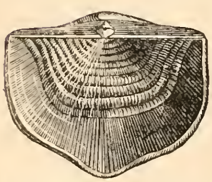
NO district in the country probably is more replete with interest to the palæontologist than that of which Worcester forms the centre. Although no fossils are found in the immediate neighbourhood of the city, other vestiges of the past no less interesting may sometimes be found by the careful observer; while at various points in almost every direction and within easy walking distance of the city, fossils in abundance of various ages may be found. To the west of the city, in the vicinity of the Abberley and Malvern Hills, Silurian fossils—crustacea, crinoids, corals, and mollusca, abound. To the east, in the direction of Himbleton, Crowle, and Broughton Hacket, interesting reptilian remains occur, and to the north and south, within a short distance by rail, fossils of the carboniferous and oolitic epochs respectively are well developed and may be easily obtained.

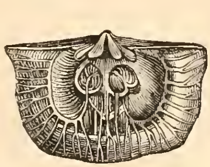
The pleasures open to the fossil hunter cannot be realised by the uninitiated. It has been well said by Reade that "Stones are curious things; if a man is paid for breaking them, he is wretched; but if he can bring his mind to do it gratis, he is at the summit of content." The study of palæontology has many advantages beyond the mere gratification afforded by the gathering of fresh specimens or the discovery of unique forms, and not the least beneficial is the fact that the student is led away from the busy scenes of every-day life, the cares and worries of business are forgotten, and the mind and body are refreshed and invigorated, in the pursuit of knowledge under these circumstances. Moreover, the science itself is of absorbing interest, and becomes most fascinating to those whose love for natural history tends in that direction.

I well remember some fifteen or sixteen years ago hearing Mr. George Woodyatt Hastings, president of the Natural History Society, to whom this museum then belonged, describing his visits to the bone caves of the Wye; and how he roused the enthusiasm of his hearers by his accounts of the wonders which those caves revealed. Those no doubt were good old times, times of refreshing and instruction when the society assembled from time to time to hear of discoveries, and of fresh facts being brought to light, by the men the results of whose labours surround us to-day. Giants there were in those days, and herculean labours were performed by them; but there are problems which still await solution, and the means for solving them are to be found in this district to-day.

Most of you no doubt must be aware that the Worcester Natural History Society came into existence in 1833. Dr. Hastings (afterwards Sir Charles)

Fig. 134.—*Lingula Lewisii.*





Figs. 135 and 136.—*Strophomena depressa*, showing exterior and interior of valves. (From Taylor's "Common British Fossils.")

became its first president, and delivered an inaugural address at the opening of this Institution as the Museum of the Society in 1836. For upwards of thirty years he held that position, and was the guiding spirit in all the transactions of the Society. In 1886 Sir Charles Hastings was succeeded by his son, Mr. G. W. Hastings, now M.P. for the eastern division of this county. There were men among the members of that Society who yearned to see this institution doing an extended work, and in the year 1879, after the adoption of the Public Libraries Act by the citizens of Worcester, the proprietors of the Natural History Museum resolved "To give up and make over to the corporation (without any valuable consideration), the whole of the property of this Society, comprising the lease of the Museum Building, some shares and interests in the reversion thereof, and the collection of specimens, books and pictures in the said building contained, with the intent that the said property may be used in perpetuity by the corporation for the purposes of, or in connection with, a free library and museum for the said city." "Simple words and gracious withal," adds Mr. Downes in his "Retrospect," "in which to clothe a present to the city worth twice ten thousand pounds!" Few cities and towns are more highly favoured in the possession of a collection so fine and, in some respects, unique, than the city of Worcester; and it must be a matter of earnest wish that there may be found those capable and willing to carry on and develop the good work commenced with so much ardour and enthusiasm rather more than half a century ago by those earnest pioneers. Before passing on to the consideration of our subject, I would invite your brief attention to the portrait on the north side of the room. The late Mr. George Reece was curator of this museum during a period extending over fifty years, and the splendid collection of natural history specimens here located mostly obtained under his auspices, is an eloquent

Fig. 137.—*Ctenodonta contracta.*

Fig. 138.—*Orthonota parallela.*

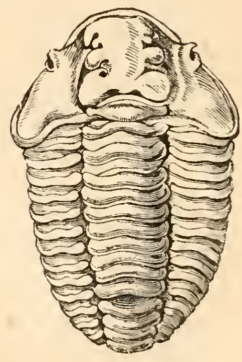


Fig. 139.—*Calymenene Blumenbachii.*

testimony to the ability and perseverance, the patience and devotion to duty which always characterised him.

The geological features of the Midland district have been described by Professor Lapworth* as constituting a sheet of red sandstones and marls, through which protrude in numerous bands and patches the older palæozoic rocks. The triassic beds have been bent into several long low arches, or broad domes, whose longer axes range approximately north and south. The summits of many of the arches have been denuded, and the underlying older rocks have again been bared to-day. Four of the arches are especially conspicuous, those of the Wrekin, Malvern, Dudley, and Nuneaton. In each of these the underlying coal measures are laid bare, forming the four coal-fields of Coalbrookdale, Forest of Wyre, South Stafford,

* "Handbook to Birmingham," p. 217.

and Eastern Warwick, all of which show round their outer margins a narrow band of the intermediate formation of the Permian. In each of these anticlinals, too, the denudation of the core of the arch has been sufficient to wear away the carboniferous from its centre, and to expose to view yet older formations—the old red sandstone in the Forest of Wyre, the Silurian in South Staffordshire, the Malverns and Coalbrookdale, and even the Upper Cambrian and its underlying igneous rocks in the Wrekin, the Lickey, and near Nuneaton. With the exception of the Silurian of Abberley and Dudley, and the recently-discovered Cambrian of Nuneaton, however, the pre-carboniferous rocks are comparatively inconspicuous, rising up merely in narrow bands in the cores of long wedge-shaped hills.

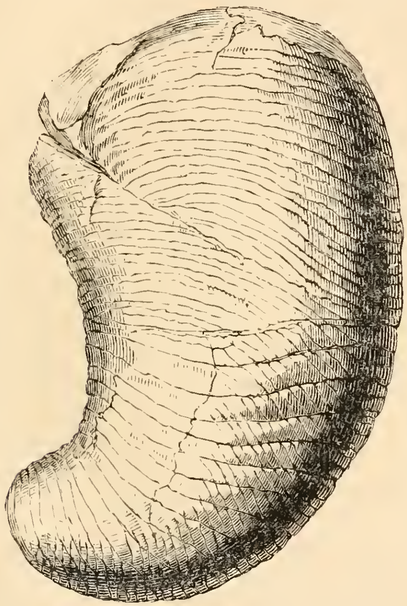


Fig. 140.—*Phragmoceras*. (From Taylor's "Common British Fossils.")

Professor Lapworth is further of opinion that the rocks which occupy the lowest place in the geological formations of the district are those crystalline and partly schistose masses which form the core of the Malvern Hills. That these rocks are of higher antiquity than the Upper Cambrian of Wales is demonstrated, he says, by the fact that fossiliferous rocks containing Cambrian fossils of this age overlie them, while the lowest recognisable zones of these overlying fossiliferous rocks, the Holly Bush sandstone, are in part composed of their fragments. Dr. Holl has described the old gneissic rocks and crystalline schists of Malvern, which were originally considered to be altered Cambrian strata, to be relics of an old pre-Cambrian continent, and after examining the Laurentian Rocks of Canada and comparing them with the pre-Cambrians of the Malvern district, he considered them to be of equivalent age. The Rev. W. S. Symonds has suggested also that the Syenitic Rocks seen near Martley, and also between Berrow Hill and King's Common, along the line of the Abberley Hills, may be of pre-Cambrian age. In this district then will be a core of the denuded dome of Malvern, the first of the many stony pages of "Nature's Infinite Book of Secrecy," the pictures of which we propose to look at to-day; and the very excellent stratigraphical arrangement of the specimens in these cases will render our task comparatively easy.

The oldest known fossiliferous rocks in the Midland district are the Upper Cambrians which rest against the crystalline rocks to the south of the Herefordshire Beacon, and along the slopes of the Midsummer and Key's End Hills. The lowest zone is the Holly Bush sandstone which yields worm tracks and burrows, graptopora, and the brachiopod, *Kutorgina cingulata*, specimens of which may be now examined. Next in order above the sandstones, and resting conformably upon them, occur the black shales which crop out in the valley of the White-leaved Oak, and from which may be obtained the beautiful little trilobites so characteristic of them. The black colour of the shales, due to the presence of carbon, has led to the fruitless search for coal, and some of the members of the club have obtained specimens of Olenus from a field, the name of which—Coal Hill Field—seems designed to perpetuate the folly or the ignorance of those who made that ill-starred attempt. Pleasant memories remain

Fig. 141.—*Orthoceras*.

with many of us of sunny rambles in that delightful district, where wooded hills and picturesque dales afford umbrageous walks and undulating meadow-land. Interesting and profitable too it is to the palæontologist to spend a day in that locality where his labours are sure to be rewarded with specimens such as can only be found in very few other localities in Great Britain.

Turning again to our stony-book we find that several pages are here missing. There is a marked unconformity in the rocks which flank the Malvern range, and a whole series—the Upper Cambrians of Sedgwick, the Lower Silurians of Murchison, the Cambro-Silurian of other authors and the Ordovicians of Professor Lapworth, are absent. Let me invite you to consider what this means. This unconformity shows that while the Ordovicians were being deposited in Shropshire and Wales, the Malvern district was high and dry above the sea, and formed part of the coast line of an island or a promontory during this epoch of the earth's history. Some years ago Miss Phillips discovered a breccia of Llandovery age, now locally known as Miss Phillips' conglomerate, which is made up entirely of fragments of the older Malvern rock upon which it rests unconformably. Specimens of this conglomerate may be seen on the landing, and many members of this club have also obtained specimens. Now, the presence of Miss Phillips's conglomerate proves conclusively this point.

The fossils of the Llandovery rocks are represented here by fucoids, annelides, corals, principally petraias, which are elegant little casts of cyathophyllum—brachiopods, such as *Lingula parallela* from the Obelisk Hill, *L. Lewisii* from Old Storridge; *Orthis alternata* and *calligramma* from Ankerdine, *Rhynchonella*, *Strophomena*, and *Spirifera* from Howler's Heath; and, what is most interesting of all perhaps, a pentamerus in close contact with igneous rock from the Worcestershire Beacon. The Lamellibranchiata are represented by *Avicula Pterinea* and *Ctenodonta* from Howler's Heath; the trilobites by *Phacops*, *encrinurus*, and *Calymene* from Alfrick. The fossils, however, although thoroughly representative of the series, do not by any means include all the species or even genera which these rocks yield: and let us hope that at no distant date the exigencies of space will no longer preclude public spirited collectors from having an opportunity of adding fresh specimens and thus making the collection, now a most excellent one, still more worthy of this ancient and faithful city, and of the traditions of this museum.*

The pentamerus beds of the May Hill sandstone are also exposed at the Lickey, and casts of fossils it is said may be obtained in abundance at the village of Rubery.

* Since writing this paragraph I have been told that there are no less than forty boxes full of fossils unpacked, it being impossible, from want of space, to exhibit them.

Far more interesting, however, to the young collector are the rocks which succeed the Llandovery.

The Wenlock series are noted far and wide for the abundance and beauty of their fossil remains. Consisting principally of limestones and shales, and having a thickness at Malvern of 280 feet, the beds form a most extensive and happy hunting-ground. Disappointment has never yet attended a visit paid to the Wenlock quarries, but bags well filled with pretty forms of various species reward the visitor. No longer are we limited to the casts of a few worm tracks and some half-dozen other forms very difficult to obtain, but at a single visit to a typical quarry in this formation, more specimens could be obtained than the collector would care to carry home. Of varied beauty are the corals. Elegant little cup corals from which potters might take many a unique design, round or disc-shaped sun corals, the syringopora resembling the pipes of a miniature organ, the halycites forming a network of chains, and the star-shaped astrea, are forms more or less abundant in the rocks, and all represented here. Of the mollusca several fresh forms appear, no less than eighty-six being enumerated by Sir Roderick Murchison, but not one-half of which are to be found in these cases. Of the sea-lilies, or encrinites, many fine examples on slabs of Dudley limestone may be examined. Of the trilobites, which, as long ago as 1771, received this name in Walsh's "Natural History of Petrifactions," there are sufficient examples here to excite our admiration and wonder, although to most of my hearers their forms and names will be most familiar. Nor can we refrain, even in such company, from contrasting the minute Olenus, averaging the size of a pea, with the squat lumpy Illœnus some four inches in length. Some of the little creatures rolled up so tightly, remind us of the wood-lice of our gardens. Neither can we always refrain from expressing admiration at the elegance of the body, the diversity of detail in the various parts, or the wonderful construction of the eyes; nor to wonder why one species should possess no eyes at all, and another, according to Owen, should have no fewer than six thousand. As regards the number of species of Silurian crustacea, Murchison enumerates no less than one hundred and ninety, but all are not trilobites, a few being crustaceans of other types. In this number so much variety is found in every part that it would be tedious and outside the scope of this paper to enter into details, but it might be useful to indicate the general characters. The body is oval in shape, and is separated by two longitudinal furrows into three lobes—hence the name. The central lobe of the head is called the glabella and is separated by furrows from the cheeks, one part of each of which is either movable or free, and bears the eyes. The posterior angle of the cheeks is sometimes produced into spines. The thorax is made up of segments which vary in number from two to twenty-six. Each ring consists of an axis with pleuræ on each side. The pleuræ are sometimes faceted to enable them to slide over each other when the animal rolls itself up. In other cases the pluræ end in points. The tail, or pygidium, is in one piece; the margin is sometimes entire, and sometimes it is produced into points. No undoubted traces of legs have ever been found.

Much of the lower ground stretching immediately west of the Malvern Hills from the British Camp to Cowleigh Park consists of Wenlock shales, and the Wenlock limestone forms the high ground beyond. The quarry in Purlieu Lane, the ridgeway at Eastnor, the Croft quarries below the Westminster Arms yield plenty of good fossils. At the west end of Malvern tunnel small trilobites, mostly curled up, abound, and as many as half-a-dozen, some quite perfect, have been obtained at a single visit of our club. It would appear, I think, from the number of fossils displayed in these cases, that during the construction of Malvern tunnel, the late Mr. Reece must have forsaken the museum and have taken up his quarters in the shanties of the navvies engaged there. The place must have been a veritable museum, and it is a matter of congratulation that such an opportunity, which can only occur once in the course of centuries, was not allowed to slip by without the greatest efforts being made to secure the specimens then brought to light. At Hill End Martley, Ridge Hill, and the quarries extending from Hillside to Woodbury Hill, also abound the typical fossils of this formation. Unfortunately, this latter district appears either not to have attracted, or its inaccessibility to have repelled, the Worcester collectors who formerly sent their specimens to this museum. Although most prolific ground, it is positively unrepresented. The distance, however, has proved no obstacle to our club, and although the walk is a most tedious and dreary one, many a member's collection is enriched with splendid examples of Wenlock fossils obtained there. The absence of specimens in this museum is much to be regretted, the more so as this district seems to yield forms not so easily obtained elsewhere. I have myself found many genera of polyzoa, which I have found great difficulty in determining, owing in some measure to this omission. Fortunately, however, some time ago, I obtained an introduction to Mr. Geo. R. Vine, of Sheffield, who has made the polyzoa his special study, and to him I have submitted my specimens. Mr. Vine said that none of the forms which I sent were polyzoa, according to his work, but that they were allied to the bryozoa of American palæontologists.

The Ludlow formation, which succeeds the Wenlock in stratigraphical order, falls naturally into three divisions—lower, middle, and upper, but the middle division is better known as the Aymestry limestone. The Lower Ludlow, according to Murchison, is simply an upward prolongation of the Wenlock formation."* "One of the most prevalent of the organic bodies found in the Lower Ludlow," he adds, "is our old friend, *Calymene Blumenbachii*, and it is accompanied very frequently by the long-tailed asaphus, or, as it is now called, *Phacops longicaudatus*. The earliest fish (Scaphaspis), occurs in these beds. The Aymestry Rocks are more crystalline than the beds on which they rest, or those by which they are succeeded. The most characteristic fossils are *Pentamerus Knightii*, *Rhynchonella Wilsoni*, and *Lingula Lewisii;* the last so named because the Rev. T. T. Lewis first worked out the relative position and fossil contents of the Aymestry limestone, where the fossil is found most abundantly. Sir Roderick Murchison has spoken of Mr. Lewis as "my most efficient coadjutor in all the regions of Siluria." The Upper Ludlow beds are remarkable for the abundance of fish remains they yield, and for the first appearance of land plants. Some care is required when working in the Ludlow and Aymestry at Abberley. Professor Philips has pointed out in his memoir that there is an anticlinal of Aymestry Rock which has the singular character of being folded or bent on an axial plane dipping to the east, so that the Ludlow Rocks overlie the Old Red beds, while on the east the ridge of Wenlock limestone is seen dipping in the same direction as if it were a superior stratum.†

The members of the club have visited upon more than one occasion this charming district, where at almost every turn of every road a different prospect opens out, presenting fresh views of the varied features of this lovely country. The quarry in Walsgrove Hill, which attains an altitude of 880 feet, and seems to bid defiance to the Abberley height opposite, which rises more than 100 feet above it, is remarkable for the great abundance of *R. Wilsoni* which stud the face of the rock, there almost perpendicular. Pleasant—exceedingly pleasant—it is at the close of a day spent about those hills, each one reposing beneath a crown of luxuriant foliage, when the fatigues of the day begin to warn one that rest and refreshment must be sought before the return journey is commenced, to hear in undulating cadences, now borne upon the fitful breeze, now gently subsiding into softer strains, the melodious notes of "Home, sweet home," from the rich and full-toned peal in the valley just at hand. Not less picturesque, but perhaps more romantic, is Purlieu Lane, or, as the natives call it, Perley Lane, Colwall, where all the formations from the Upper Llandovery to the Upper Ludlow are passed over in succession. At Brockhill Copse, Upper Ludlow fossils are found, the neat little Orthonota and the long strap-like *Serpulites longissimus*. It is a matter for extreme regret that no fossils from the Ludlow or Aymestry beds find a place anywhere in these cases.

* "Siluria," p. 138. † Geol., p. 16.

But what shall I say of the Silurian fauna? Time will not permit me to speak in detail, even if details would interest you, of the small elliptical *Lingula minimus*, which shines with a dark metallic lustre on the brown Llandovery sandstones of the Obelisk Hill; nor of its near but more important looking relation, the pearly enamelled *L. Lewisii* of the Aymestry. The Atrypa, Discina, Meristella, the Pentamerus, Retzia, and Rhynchonella, and the Spirifera and Strophomena, are all so common in the Wenlock and Ludlow rocks that they may be counted by the hundred. These all belong to the prevailing type of shell of those early periods, the Brachiopoda, which by many hundreds to one outnumber the true molluscan type. A most important group was the Cephalopoda—the chambered type of shell—whose modern representatives are free swimming and carnivorous, and, says Sir R. Murchison, "we may presume that they were the appointed tyrants and chief scavengers of the Silurian seas." Commonest amongst these are the Orthoceras and Phragmoceros, types almost exclusively palæozoic, and the precursors of the Ammonite and Belemnite of Mesozoic times, and of the octopus or devil-fish of modern seas. The Gasteropoda formed an intermediate class, being inferior to the Brachiopoda in regard to numerical strength, and to the Cephalopoda in structural importance. They were the precursors of the modern snail and slug, and the Euomphalus and Murchisonia are the commonest fossils of this class. The Encrinites of Silurian times, represented in these cases by the graceful forms from Dudley, were attached by jointed stems to the rocks, and Hugh Miller, whose graphic powers seem to make obsolete forms instinct with life, says that they "rose in miniature forests, and spread forth their sentient petals by millions and tens of millions amid the waters, while vast ridges of coral, peopled by their innumerable builders—numbers without number—rose high amid the shallows." The earliest remains of fishes in the lowest zone of the Ludlow rocks are very meagre, but in the upper zone remains are found in great profusion. Sir Roderick Murchison says that there is a band or layer of the thickness of three or four inches which exhibited a mass of bony fragments. Some of the fragments of fish are of a mahogany hue, but others are so brilliant a black that, when first discovered, they conveyed the impression that the bed was a heap of broken beetles. I hope the club will search for this bed.

The passage beds lying in unbroken sequence between the crest of the Upper Ludlow on the east and the base of the Old Red Sandstone on the west, may be well seen at the Ledbury Railway Station, and those of our members who were fortunate enough to hear Mr. Piper, F.G.S., at a recent meeting of the Woolhope Field Club, describing the various beds which he had mapped out and numbered, will not readily forget the enthusiasm with which he described his capture of the bony plated little ganoid Auchenaspis, and the no less interesting but more common bucklerhead, Cephalaspis. Mr. Piper, with the assistance of Henry Brooks, of local Auchenaspis fame, had commenced his measurements from an Old Red Rock opposite the goods shed, and had found the passage beds, twenty-two in number, to be 400 feet thick, of which about 25 feet only were fossiliferous. Higher up in the Old Red rocks themselves fishes become much more common, but although we are within an hour's ride by rail of that interesting and quaint old town of Ledbury, which nestles within an amphitheatre of wood-crowned hills—hills which in response to the hard and diligent appeals of the hammer will readily yield up their treasures, not a single specimen has apparently ever found its way into our Museum. Hugh Miller grows eloquent when contemplating these ichthyic remains. "Some of the fish," he says, "were furnished with bony palates, and squat firmly based teeth, well adapted for crushing the stone-cased zoophytes and shells of the period; some with teeth that, like those of the fossil sharks of later formations, resemble lines of miniature pyramids, larger and smaller alternating some with teeth sharp, thin, and so deeply serrated, that every individual tooth resembles a row of poniards set upright against the walls of an armoury; and these last, says Agassiz, furnished with weapons so murderous, must have been the pirates of the period. Some had their fins guarded with long spines, hooked like the beak of an eagle; some with spines of straighter and more slender form, and ribbed and furrowed longitudinally like columns; some were shielded by an armour of bony points; and some thickly covered with glistening scales."

But in the formation above the Old Red, the Carboniferous, the fishes, although common, do not so preponderate as to give a special character to the rocks. Land plants become the characteristic fossil, and must have abounded in glorious and luxuriant profusion in those times. In the forest of Wyre Coal Field it is no uncommon occurrence, I am told, for the colliers to find in the "clunch," or stiff red clay which occurs both above and below the coal, the graceful fronds of an ancient fern, showing all the delicate tracery of its venation; its jet black lustre presenting a striking contrast to the rich red colour of the clay in which it is preserved. Unfortunately, the clay when dry becomes friable, and it is impossible to preserve a specimen in a cabinet for a very long period. It is more like playing at colliers than real work on the margin of the coal-field at Frith Common and Mamble where the pits are only from fifteen to twenty feet deep, and into which we are lowered in a bucket by a windlass. It causes a strange and curious sensation to find ourselves grubbing along on hands and knees in those narrow and shallow workings, lighted up here and there by a naked candle, the end of which is embedded in a lump of soft plastic clay by which it is attached either to the side of the working or to the front of the collier's cap. Very different, however, are the Earl of Shrewsbury's Brereton collieries, where six hundred yards below the surface the rattle of machinery and the busy throng of workers, almost make us forget that the light is artificial, and that there is so tremendous a barrier between us and the outer world. Many a time have I beheld with wonder the myriads of anthracosia in countless profusion studding the black shales of the ceilings in all directions for miles and miles. But the anthracosia, although so abundant and close at hand, unfortunately finds no place in these cases. A meagre collection of plants from the Severn Valley Railway Cutting are the only representatives here of the graceful but withal fantastic forms which remain to us of that magnificent flora of carboniferous times. A few very fine bones and teeth and spines of fish from Oreton appear to be the only representatives here of the massive and prolific limestones which underlie the coal measures. Fossil remains of this formation, however, occur very sparingly in this district. Some very fine examples may be seen in the general museum.

The Permian rocks are exposed in the north-east side of the Malvern Hills, particularly at Woodbury and Stagbury. There is also a very interesting exposure near Knightwick Station, where it is known as "Rosemary" rock. It is a coarse breccia and some of the enclosed boulders are from one to two feet in length. No fossils however of this age are found in the district. According to Sir Andrew Ramsay, "this Permian breccia is probably of glacial origin, simply old boulder clays formed at a glacial period in Permian times, its materials having been brought down into this district by ice from the neighbourhood of the Longmynd in Central Shropshire, where all the formations represented in its derived rock fragments occur at present in natural juxtaposition." The fragments include volcanic "tuffs, altered shales, grits and fossiliferous sandstone and limestones, all embedded in a paste of bright red marl or pebbly sandstone." Mr. H. B. Woodward, of the Geological Survey, says that the glacial origin of these rocks has been disputed by Professor Bonney and others, who consider the polishing and scratching of the boulders to be due to the friction between the stones themselves. Might not this disputed point be investigated and verified by the Worcester Y. M. C. A. Rambling Club?

By some geologists the Permians are classed with the Triassic rocks under the name of New Red Sandstone, and placed at the base of the Mesozoic group. Others place the Permians at the top of the Palæozoic group, and regard the series as a fitting termination to the older system of rocks. As a matter of fact the Permians are allied by their fossil contents to the Palæozoic group and by their lithological characters to the Triassic system.

The Bunter sandstone is the lowest member of the Trias, and a year or two ago might have been seen exposed at the back of the Belle Vue stables, Malvern, flanking the hills, but it is now obscured by buildings. The beds are totally unfossiliferous. Upon them rest the waterstones, or pebble-beds, which in their turn are overlaid by the Keuper Marls, a series extending from the Malverns to Bredon. The sandstones and pebble beds are noted for their water-bearing characteristics, and it is into these beds that the trial bore-hole has been made at Charford, about which we have for some time heard so much at the city council meetings.

Mr. G. E. Roberts has pointed out, what must be obvious to the most casual observer, that in passing from Worcester to Crowle we mount a series of ridges, sloping terraces leading to yet higher ground, each of which is as clearly an upward step in the geological ladder as it is in the surface level of the country. We are climbing as it were up to the Lias. The Keuper beds yield but few fossils, the seas of that period being so highly charged with salts of iron, chloride of sodium (common salt), and sulphate of sodium (gypsum) as to make it prejudicial to life, and to resemble in some degree the conditions prevailing in the region of the Dead Sea of our own day. *Pallastra arenicola* is said to have been obtained from the Crowle escarpment; and footprints of the Labyrinthodon, with bones and teeth, have also been met with.

At Dunhampstead the Rhætic beds are faulted against the Keuper Marls, but beyond a few worm-tracks appear to yield no fossils, and in this respect differing considerably from the rhætics of Westbury and Penarth, where the beds are most prolific. The nearest exposures of the lias are at Himbleton, Crowle, and Broughton Hackett, where the lowest beds, the contemporaries of the zone of *Ammonites planorbis* of Yorkshire, come to the surface At Bredon Hill there are good sections of the middle lias or marlstone, the upper lias and the inferior oolite. The fossils from the blue lias are represented in this museum by worm-tracks, spines of cidaris, and mollusca from Broughton Hackett; very fine remains of fish and saurians, and various shells from Himbleton. In the wall-cases on the stairs there is an upper jaw and vertebræ of a saurian from Bushley, and another specimen with a paddle from Crowle.

It is an interesting and pleasant walk to Broughton Hackett either by the main road or across the fields. From Wyld's Lane the first of a series of ridges is seen capped by Perry Wood; and in the bridle-path which runs through the wood the marl assumes a rocky nature, breaking into rhomboidal fragments and exhibiting pseudomorphous crystals. Beyond the crest of the ridge there is a level expanse of country for about half a mile. The pathway skirts the Nunnery Wood and leads into the main road at Swinesherd. Another half-mile brings us to the entrance of Spetchley Park. Here again we are tempted to leave the dusty highway for the cool and shady avenue of magnificent old elms, the long vista terminating beyond the brow of the next ridge in a mass of verdant foliage. Breezy and refreshing is this avenue on the most sultry day of summer. Every prospect pleases, for "art preceptress nature weds." Presently an opening in the trees reveals the stately mansion of Robert Berkeley, Esq. The trees are all alive and joyous with the music of birds, the fields are peaceful with the presence of cattle and sheep. Suddenly, however, the fields present an animated appearance as hundreds of rabbits scamper off and as suddenly disappear. The path takes us into the Evesham road at Sneachill, when the fields are entered again, and the main road is eventually reached at Churchill, and a mile farther on the quarries are situate. The return journey may be made by the highway; not a tedious walk by any means. Picturesque and well-wooded fields stretch away on either hand with occasional glimpses of Malvern on the left, and wooded heights on the right. A sharp turn of the road will bring us into the spreading shade of copses of oaks and beech trees, in whose branches the squirrel, "flippant, pert, and full of play," loves to gambol with his neighbours. In addition to the health and pleasure derivable from the ramble, the geologist is always sure of a good bag. *Ostrea liassica*, *Ammonites planorbis*, and *Plagiostoma*, abound, while the vertebræ and teeth of saurians are by no means rare. I well remember some three or four years ago being told by the men at the quarries that just previous to my visit a "crocodile" nine feet in length, with jaws and teeth, and ribs and tail complete, was unearthed. "Well, what have you done with it?" I immediately inquired. "Burnt him for lime," was the laconic reply. Quaint and well-worn theories have these men to account for the presence of such monsters in the rocks. "You know, sir," remarked one, "at the time of the flood the earth was all of a swill, and he must have been buried up then." Another man calmly assured me that he had seen the skeleton of a man, and he knew it by the ribs. The fossils are not scattered indiscriminately in the blue lias, but occupy definite horizons. Upon one occasion I took a sketch of the quarry at Himbleton, from whence I have obtained some of my finest specimens. The beds of limestone are six in number, and each one is known by a distinctive name. No. 1. The Rotch; 2. the Diamond; 3. the Top; 4. the Lanky; 5. the Paving Stone; 6. the Brick Bed. At the base of the last the saurian remains and *Ostrea liassica* occur. Below this there are said to be three other beds which do not pay for working: the "Owl," the "Hawk," and the "Magpie."

It is not only amusing but interesting too at the close of the day, over the nut-brown draught, and "the pipe with solemn interposing puff, which makes half a sentence at a time enough," to hear discussed the fact that the "Lanky" would be got out by breakfast-time next morning.

The marlstone at Bredon Hill yields plenty of good fossils, ammonites, belemnites, pecten, terebratula, rhynchonella, gryphæa, and nautilus; and the inferior oolite above, Pentecrinites, or lily stems, and spines and plates of echini.

The walk to Bredon, although rather long, has proved very pleasant to some of the vigorous members of our club. Starting at daybreak when "the sun with ruddy orb ascending, fires the horizon," and "the lark is gay, and dries his feathers, saturated with dew, beneath the rosy cloud, while yet the beams of day-spring overshoot his humble nest: the peasant too, a witness of his song, himself a songster, is as gay as he." And while the dew is yet fresh upon the wild flowers and new-mown hay, and the hedgerows of unfrequented lanes are festooned with wild roses and honeysuckle shedding their fragrance upon the fresh morning air, then it is that the pulse begins to bound, and the steps grow lighter, and new life seems to circulate in every part. Bredon Hill may be reached before the sun is very high in the heavens; before the light fleecy morning clouds have been dispersed by his beams. While some of us have enjoyed an early *al fresco* luncheon on the slopes of the hill, the morning clouds have swept down and obliterated the landscape. Upon a clear day a series of magnificent views may be obtained. From the summit of the hill the well-known outline of Malvern stands out clear and sharp, and the course of the Severn may be traced down the intervening valley. The summit also overlooks what has been aptly termed the garden of Worcestershire, through which the Avon in numerous windings threads it way.

At the top of Bredon Hill the lowest member of the inferior oolite is exposed; but none of the remaining secondary nor any of the tertiary rocks occur anywhere near Worcester.

In the table-case at the north end of the room, and also in the Strickland and Winnington-Ingram collections, there are some very fine remains of *Pleistocene mammalia*, obtained principally from the Avon valley. There are teeth of the horse, and humerus and tusk of elephas from Fladbury; tooth of hippopotamus from the gravel at Little Comberton; lower jaw and teeth of elephas and femur of horse from Cropthorn; portion of tusk from Droitwich; femur of elephas, and humerus of hippopotamus from Eckington. There are also some fine antlers of cervus from Charbury, Brookside Hanley, and Tewkesbury, and also from the Severn at Diglis.

Canon Ingram has said of his own collection, recently bequeathed to the Worcester Museum, that "the cattle and other animals that roamed the hills in the environs of the Vale of Evesham, in pleistocene and pre-historic times, were represented by their remains discovered in the estuarine and lacustrine and fluviatile gravels of that locality. The tusk of a river-horse, found in a loamy deposit about sixty feet above the level, and half a mile from the present channel of the Avon, in close proximity to a reindeer's skull, showed that the Avon, once running with a greater volume, and affording a watery retreat for the hippopotami, bore down in its course carcases of reindeer drowned in crossing the stream during their migrations to and from a more northern latitude."

I have examined the drift at Himbleton and Pershore, from whence I have obtained lias fossils, cardinia, rhynchonella, belemnites, etc., all more or less waterworn. From the drift at King's End, Powick, I have found the cast of a rugose coral of the silurian age.

The evidences of ice action in this neighbourhood are somewhat meagre. But some six years ago a man named Wood, when mowing at Corn Meadows, Claines, struck his scythe against a boulder, which was partly embedded in the earth. Thinking that this stone at some future time might break a scythe, he determined to remove it, and subsequently tried to dig it out, but, to use his own words, "the deeper he dug the bigger it got," and two men and two horses were necessary to remove it. Mr. Wood thought the stone was granite, and offered it to the architect who was then restoring Claines Church, but the architect, with the off-hand remark, "Nonsense, man, there's no granite in this neighbourhood," declined it. Mr. Wood, however, undaunted, still believed the stone to be valuable, and steadily refused, as his friends advised, to bury it out of the way. A member of our club, Mr. Westly, in passing that way a few years afterwards, recognised in Mr. Wood's block of granite an erratic boulder of the glacial period. Dr. Crossky identified the boulder as Criffel granite. Further north these boulders are more plentiful, but there is no record, so far as I can learn, of one having been found previously so far south. This specimen weighs probably half a ton. It measures 3 ft. by 1 ft. 9 in. by 1 ft. 8 inches, and is of grey granite, rounded and sub-angular; and although it is not scratched, it has doubtless been transported by ice agency from Kirkcudbrightshire. Mr. Wood subsequently sanctioned the removal of the boulder to this museum, and it may be seen in the vestibule below. I have dwelt upon this matter thus in detail because I cannot but admire the enthusiasm of Mr. Wood; and, moreover, having had the honour to assist in the removal of the boulder, I feel some amount of interest in it. On the borders of Cannock Chase I have seen many boulders of granite precisely similar to the Claines boulder. In the Malvern district the late Mr. Symonds discovered a section exposed during some excavations made for some new buildings at the Wind's Point, at the residence of Mons. and the late Madame Lind-Goldschmidt. There he saw a mass of undoubted boulder clay full of the angular fragments of silurian rocks from the other side of the pass. "This," he says, "was undoubtedly the track and moraine of an ancient glacier, the ice of which probably filled the great combs between Little Malvern Church and the Camp Hill; and which sent down its moraine matter over the common below; moraine matter which" he adds, "has broken many a plough, and puzzled many a cranium as to how the 'darned' stones got there." Mr. Edward Hull, of the Geological Survey, says that he is not aware of the existence of genuine ice-drifted boulders south of Bredon Hill on the Vale of the Severn. This great outlier of the Cotteswolds stretching right across the vale, must, to a great extent, have acted as a barrier to rafts or bergs of ice on their voyage southwards.

FORMATION OF CHLOROPHYLL IN PLANTS.

It has long been held by competent authorities that light, however little, is essential to the formation of chlorophyll in plants; but the other day I came across an instance which seemingly shows this theory in a different aspect, and that chlorophyll, or the green colouring matter of plants, can be developed without light of any kind. When cutting open one of those large yellowish melons, which are to be had so abundantly in fruit shops at the present time, I was very much surprised to find that one—and only one—of the many seeds which it contained had germinated, and that both of its cotyledons were quite green. There was not the slightest opening or fracture of any kind whereby either light or air could enter, and the melon was perfectly fresh and well tasted, showing that no air had been getting into it.

I enclose a full-size drawing of the young plant made after it was pressed and dried, from which it will be observed that the plant had attained to the size of fully three and a half inches in length over all. It will also be noticed that one of the cotyledons is fully half an inch long and a quarter of an inch broad, while the other is slightly less in size. The radicle is also nearly three-quarters of an inch long, and a rootlet about a quarter of an inch in length.

Can any of your readers explain how this one seed, out of so many, should have germinated inside the melon, without air and light, both of which are said to be necessary for the germination of seed, and at the same time have both the cotyledons as green as if it were grown in soil with a full exposure to the sun?

I am aware that the cotyledons of the sycamore, great maple or plane tree (*Acer Pseudoplatanus*, L.), and the prickly saltwort (*Salsola Kali*, L.), have green cotyledons inside their seed coverings, but they are developed by the parent plants in that state, and I presume we may also include our common green or blue pea in the same class. Although these cotyledons have not been exposed directly to light and air before germinating, I think the presence of the chlorophyll in their cases may be accounted for by the parent plants depositing it in the cotyledons during their development, in the same way as albumen and starchy matters are formed and deposited by other plants in various parts of their structure. It would be as easy for a plant to form through the action of its leaves chlorophyll for its cotyledons as to make, say, albumen for them, and in this way the theory of light being necessary for the formation of chlorophyll would still hold good. But in the melon seeds, the cotyledons are white inside. Whence, then, came the chlorophyll for the cotyledons of this seed which germinated? Although the outside of the melon was pale yellow, would it be possible for any chlorophyll to be distributed throughout the flesh or fluid of the melon, yet in such small quantities as not to be visible or give any distinct green colour, but still sufficient to colour green the cotyledons of the young plant when absorbed into them? We may in this way find an explanation for the presence of chlorophyll. I merely make the suggestion as it seems to me at the present moment the only way to account for it, if we are still to believe light as being necessary to the formation of chlorophyll. Otherwise we must come to the conclusion that plants may become green in colour although shut off completely from light of any kind whatever. But suppose we account for the presence of chlorophyll as I have suggested, how are we to get over the difficulty as to air? No air could possibly get into the fruit, so far as I could see. In all our botanical works we are taught that air is as essential for germination as either light, heat, or moisture, but no air could get inside the melon to sustain its seed, unless what air may have occupied its cavity would be sufficient for it. Perhaps some of your readers may be able to explain these points to which I have referred, as I am sure it will be both interesting and instructive.

J. BALLANTYNE.

Fig. 142.—Tracing of a young plant found inside a yellow Melon, Sept. 18th, 1890. Cotyledons quite green.

ASTRONOMICAL OBSERVATORIES AND WHAT IS DONE THERE.

By F. W. LEVANDER, F.R.A.S., ETC.

THERE must be very few indeed of my readers who have never heard of an astronomical observatory, many may have seen one—they are not very common; but I suspect that only a comparatively small number have ever been inside one or have more than a vague notion of the work done therein. Our National Observatory is so close to the metropolis that many of the inhabitants of the "little village" are acquainted with its outward appearance; but we are not all Londoners. Besides, those who do go to Greenwich to look at the observatory are obliged to content themselves with gazing at the clock, the twenty-four hour dial of which, being inserted in one of the walls, is visible to the public, or getting some information as to the height of the barometer, or comparing their linear measures with the few copies of Imperial standards on the outer wall. Their attention may, too, have been called to the various domes, one or more of which, or the great drum itself, may have a slit open to the sky, and they may have been told that "astronomers were at work," with which somewhat indefinite statement they have gone away content. Nor, indeed, would they be enabled to satisfy any innate curiosity further, for without powerful credentials no one is allowed within the observatory itself. The stranger is, ordinarily speaking, no welcome guest there. In some foreign countries it is much easier to gain admittance to the interior of an observatory than is the case in our own country, and it is, perhaps, due in a considerable measure to this that we find around us such a lamentable ignorance—I speak advisedly, and from long experience—of even the commonest facts respecting the heavenly bodies, not to mention those which concern our own earth. The study of Nature, the inquiring into those causes which are found to produce order out of apparent disorder, the harmonious obedience to which is erroneously referred to the *laws of Nature*, must have an elevating effect on the minds of all who pursue this course aright, whatever branch of science is taken up. Astronomy presents us with a view of the workings of nature on the grandest scale; he who can survey the heavens on a clear night without some noble thoughts entering his breast must indeed be earthly. The more one studies the heavens, the greater must be one's admiration of the works of the Great Architect of the Universe.

An astronomical observatory may be briefly defined to be a place where astronomers observe the heavens by means of special instruments. I purpose to describe somewhat minutely such a place, and the various instruments and appliances to be found there, as well as some of the wonders of the heavens as seen by their aid, and to note the more important discoveries that have been made at various times in connection with the science of astronomy.

The chief instrument employed is, of course, a telescope, that is, a device by which distant objects may be brought apparently nearer to us, so that we may be enabled to scrutinise them with greater minuteness. Most people are acquainted with the outward appearance of a telescope, but its interior arrangements are probably a mystery to them. It may, therefore, not be lost time if we briefly consider its history and examine its construction. There are two sorts of telescopes, the one called refracting, the other reflecting. Of these the older form is the refractor. The credit of its discovery seems to lie between three persons, named respectively Henry Lipperhey, Zacharias Jansen, and James Metius, who lived in the very early years of the seventeenth century. One or other of these accidentally noticed that by holding a concave glass near the eye, and at the same time placing a convex one farther off, but parallel to the first, distant objects appeared to be magnified. Galileo, who had heard of this remarkable discovery, constructed a somewhat similar instrument in 1609. Two years later Kepler described how a telescope could be formed by a combination of two convex lenses, but he did not practically prove his theory. Indeed it was not till about fifty years afterwards that such instruments were employed generally in making astronomical observations. The early telescopes were of very small diameter, but astronomers are always asking for "more light." It must be remembered that the light received by an object-glass, as the larger glass at that end of the tube farthest away from the eye is called, when compared with that received by another, varies as the squares of their respective diameters. In the many attempts that were made at different times to keep pace with the demand for larger instruments, some important drawbacks presented themselves. One was the great difficulty experienced in making the lenses of the proper shape; for the proper curvatures of their surfaces have to be determined mathematically, and the glasses ground to these curves and then polished. Then, again, when object-glasses of larger size were attempted (though this difficulty did not at first show itself), it was found almost impossible to obtain a glass disc that was homogeneous and free from streaks and other imperfections. A third difficulty was that met with in consequence of the phenomenon known as chromatic aberration. If we take an ordinary lens and look through it at a bright object, we shall find that all the outlines of the latter are fringed with different tints, commonly called the colours of the rainbow. Such an array of colours round a celestial object would naturally be a serious obstacle to any accurate observation. It was not till 1729 that the difficulty of producing glasses which should show an image free from extraneous colour was surmounted by Chester More Hall. Though he made several instruments of this description he did not publish his researches, and the credit of being the first to make an achromatic lens, that is, one which will show images of the objects viewed without the coloured fringes, is assigned to John Dollond, thirty-one years later. From his experimental researches on light, an account of which will be found in the "Philosophical Transactions" of the Royal Society for the year 1758, Dollond found that the desired end could be gained by placing together two lenses, the one nearest the object to be viewed being made of crown glass, and having its surfaces convex, the other made of flint glass and with concave surfaces. Many years, however, before the production of Dollond's object-glasses, attempts were made to overcome the difficulties we have mentioned by using telescopes of a totally different construction. Instead of viewing the object through a lens or lenses, the light proceeding from it was allowed to fall on a polished mirror, made of metal and ground to a particular shape. If we place a looking-glass against the wall in the middle of a room, and, standing at one end of the room, look in the glass, we shall see reflected from it the objects that are at the other end of the apartment. If now we carefully measure the angle made by the surface of the glass and a line drawn from those objects to that part of the glass where they are seen, and that made by the same surface and another line drawn from our eye to the same point, we shall find these angles to be equal. To put it into technical language, the angle of incidence (that is, the angle at which the light falls) is equal to the angle of reflection. The same law holds good with all mirrors, whether their surfaces are flat or curved. Consequently it was found that, by using curved mirrors, the light falling on such a one could be caused to be reflected in a direction not far removed from that of the line in which it originally fell. By using mirrors of proper curvature, all the light will be *reflected* to one point; whereas in the case of a lens the light which falls on it is *refracted*, or bent to one point. Hence arise the two names, reflector and refractor, as applied to telescopes. Whichever sort of telescope is employed, as the use of the mirror, or object-glass, is merely to collect light and bring it to one point called the focus, the image there formed must be enlarged. This end is accomplished by means of a small lens, or combination of lenses, known as the eye-piece. In the case of astronomical telescopes the eye-piece usually consists of a tube containing two double convex lenses of different sizes; the larger of the two faces the object-glass, and is called the field-lens, the other, the eye-lens. These two glasses are so arranged as to be equivalent in use to a single lens, and we can, by a little calculation, find the focal length of the combination. Since the light-gathering power depends on the size of the object-glass or mirror, it is, of course, always the same for a given instrument; but the amount of magnification depends upon the eye-piece that is used, and is determined by dividing the focal length of the object-glass or mirror by that of the eye-piece. "Deep" eye-pieces are those the focal length of which is short. The first person who actually made a reflecting telescope was Sir Isaac Newton, about 1670. The various forms of reflectors are known as the Newtonian, Gregorian, Cassegrainian, and Herschelian, thus perpetuating the names of their respective inventors. As regards the first three, the rays of light which fall on the mirror are reflected to a smaller polished surface, and thence to the eye-piece, while in the Herschelian the small mirror is dispensed with, the observer's back being turned towards the object to be examined. The making and subsequent grinding of large object-glasses or mirrors are matters of exceeding difficulty, and heavily tax the skill and patience of the artist. Yet the necessary knowledge has so far advanced that the mirrors and object-glasses, having a diameter of six and three feet respectively, which have already been made, will probably be soon surpassed in size.

Having obtained an insight into the construction of a telescope, we must next consider how it can best be supported so that we may be able to do good work with it. It must be remembered that a somewhat inferior telescope on a good stand is far more serviceable than a better instrument on an inferior support. The most simple form of stand for an astronomical telescope is an arrangement in which the main tube is firmly screwed, near its centre of gravity, to a somewhat long piece of metal—a cradle—which is attached by a joint to a vertical pillar. This pillar is fastened to a wooden or metal tripod, but its interior construction is of such a nature as to allow the upper jointed part to revolve at will. With such a stand the telescope will be capable of being moved in a horizontal, as well as in a vertical, direction and, therefore, of being pointed to any part of the heavens we wish. Assuming that we are in possession of a telescope mounted on a stand so firm and steady that it will not allow the instrument to vibrate after being moved, and we are anxious to do some real work with it, on the first suitable night we set up our instrument in the garden. In our changeable climate we must not expect to be out very long before clouds come up or rain begins to fall; everything has to be hurriedly brought indoors. Then it is that the observer longs for an observatory, and if his means are commensurate with his zeal, no great length of time will elapse before he is in possession of what is not merely a luxury but an absolute necessity. Then, too, he will bethink him of a better mode of supporting his telescope; but a consideration of this we will defer for the present. Of observatories there are different sorts and sizes, ranging from the modest and inexpensive Berthon telescope-house to that magnificent establishment lately completed, to which many an astronomer is directing his eager longings, the Lick Observatory.

Let us assume that by some fortunate chance we have been able to get within the charmed portals of a well-equipped observatory, and, for the better accomplishment of our design, that we have free ingress and egress at any hour of the day or night, and, in addition, that the Director has the time at his disposal, as well as the inclination, to serve us in every possible way. Our first desire will doubtless be to see the largest instrument in the establishment. Certainly our own little instrument belongs to the same class, but its relationship to the monster now before us seems very distant; moreover, there is not the faintest similarity between our simple stand and the complicated arrangement by which the enormous tube is supported. Evidently there is a great deal to be learnt here. Our Mentor explains to us how the dome or drum over the instrument is worked. By pulling a rope a slight opening, a few feet wide, is made from horizon to zenith, and by pulling another rope or turning a winch the whole of the dome or drum is caused to revolve. The open part can thus be directed to any part of the sky. Some of these domes are of enormous size, yet they are so well balanced, and their mechanism so nicely made that the apparently cumbrous mass can be easily moved by the expenditure of a very small amount of power. The mounting of the telescope rests on a solid mass of masonry or concrete, extending many feet below the surface of the earth, and entirely disconnected from the floor. This is done to obviate the effects of vibration, than which few things are more annoying to the astronomer. If really good work is to be done, the observer must be at his ease, his hands must be free, he must be able to look straight through his telescope without incurring a crick of the neck by having to twist himself about into all imaginable and unimaginable positions. We shall find various devices about the room to enable us to accomplish this very desirable end. There are chairs of the ordinary height but with sloping backs, and there are cunning arrangements by which the observer, without leaving his seat, can raise or lower it to any required height, move it in any direction, or alter the inclination of the back. In some observatories the floor itself can be raised or lowered at will.

Now let us examine the instrument itself. Its mounting, as we said, in no wise resembles our simple stand: we are told that it is an Equatorial. Who that has a telescope and an ordinary stand cannot recall some such experience as the following? He is eager to show an unscientific friend some celestial object—it may be Saturn, that wonderful planet with his belts, rings and moons, a really good view of which is so seldom obtained in England. He gets it into the field of view—as that part of the sky visible in the telescope is called—and tells his friend to look. His friend, after various ineffectual efforts, gets his eye into the proper position, glances up the tube and immediately exclaims, "It is gone!" *It* has not gone, but all the while that he has been performing his evolutions the earth has been steadily rotating on its axis as usual, carrying with it the telescope and the would-be observer. The telescope is slightly moved, another attempt made and this time, perhaps, with success. Saturn, with all his retinue, passes majestically across the field of view. Every few seconds the position of the telescope has to be altered in a direction contrary to that in which the earth is moving, and, if the stand is not well made, every movement will be attended with vibration. Such a state of things will never do when long-continued, careful observations are to be made. It is to do away with such inconveniences that the equatorial or parallactic form of mounting was devised. Of this there are two sorts, known respectively as the English and the German pattern. The latter is the more generally met with, since with it the telescope can be easily pointed to any part of the sky, which is hardly the case with the English form. If we watch the motion of a heavenly body for a few hours, we shall find that the path it appears to follow is part of a circle. Let us note, for instance, the middle one of the three stars forming the belt of Orion, sometimes called the Tailor's Yard, and watch it from its rising. We shall see that the path it describes, as it gets higher in the heavens, is not vertical. Now let us try to follow it with a telescope mounted on a simple stand. We shall very soon find that we are unable to keep the star in the field of view with either a horizontal or a vertical movement, but we must combine the two. If, however, we tilt the pillar of the stand in a northerly direction until it points to the north pole—very near which is the pole-star—we shall be able to follow the star in question by means of one movement only, but that neither horizontal nor vertical. Let us try the experiment with any other star, and we shall meet with equal success; the middle star in Orion's belt was selected simply because it is close to the equator, and for that reason somewhat better for our purpose. We have, in fact, constructed a simple equatorial stand.

But still something more is needed. We want our hands to be free, and not engaged in constantly imparting movement to the telescope. Skilful mechanicians again come to our aid, and, by means of clockwork attached to the telescope, the whole instrument is kept moving at exactly the rate required to counteract the motion of the earth. With this addition to our equatorial, let us turn the telescope to any heavenly body that we are desirous of scrutinising, and it will remain, as if it were fixed, in the centre of the field of view, so long as the clockwork is kept going. Clockwork of this description has now been brought to a very high degree of perfection. A similar arrangement is sometimes adopted for the purpose of moving the floor round.

Attached to the main tube of the telescope we notice one or more smaller ones, called Finders. On looking through one of these we shall find a cross of fine wires dividing the field of view accurately into four quadrants. When any object is seen at the centre of this cross, it will be found also in the centre of the field of view of the large telescope, for the two instruments are placed exactly parallel to each other. With a large telescope it is very difficult to point accurately to an object; even when the aperture is only a very few inches, a finder is an absolute necessity. There are, also, many other articles attached to the great tube, the various uses of which are at present a mystery to us.

Having pursued our examination thus far, we are naturally anxious to see some of the wonderful sights in the heavens that we have heard of. We, therefore, crave and gain permission to spend some hours, both by night and by day, at different times of the year, within the observatory with our guide. We shall most likely be told not to choose nights, however clear, when the wind is easterly. Clear definition is never obtained when the air is very dry. In our climate the best nights for astronomical observations are in September, and the early hours of the morning are always superior to the late hours of the evening. Finding ourselves beneath the dome, a patch of starlit sky is exposed to our view by the opening of the shutter. When we had our small telescope in the garden, we could easily recognise the familiar constellations and turn the instrument to the stars we wished to examine, but now we have only a limited amount of sky-room within view, and an element of difficulty is thereby introduced. The finding of a particular object, unless it be the sun or moon, is not a matter to be easily accomplished by the mere shifting of the telescope. If we wish to describe the position of any place on the surface of the earth, we state its latitude and longitude, that is, we say that the place is situated on a certain imaginary line, so many degrees north or south of, and parallel to, the equator, at a point where it is crossed at right angles by another imaginary line so many degrees east or west of the meridian of Greenwich. So it is with the stars; we must have their apparent places indicated by the intersection of two imaginary lines at right angles to each other. Instead of latitude and longitude, we adopt declination and right ascension. By north or south declination is meant distance north or south of the celestial equator (which is an extension into space of the terrestrial equator), expressed in degrees, minutes, and seconds. As a substitute for declination, north polar distance (abbreviated N.P.D.) is sometimes employed, being the distance, also in degrees, minutes, and seconds, of a celestial body from the North Pole. We reckon terrestrial longitude from the first meridian, an imaginary line passing from north to south through a certain room in the observatory of Greenwich, but for a starting-point of right ascension we must take something in the heavens. That which is adopted is called "the first point of Aries." About two thousand years ago the sun used to enter the constellation Aries, one of the twelve signs of the zodiac, at about March 20, the time of the vernal equinox, and it was at about the same date that the first catalogue of the stars was made by Hipparchus. This, therefore, was a convenient starting-point, and though what is called "precession of the equinoxes" has caused the sun's position to be other than what it was at the period above mentioned, the mode of reckoning has been retained. Right ascension (abbreviated R.A.) is reckoned from west to east, either in hours, minutes, and seconds of time, or in degrees from 0° to 360°.

Our friend, wishing to show us some particular object, hunts up its place in a star catalogue or in the Nautical Almanack, and then explains to us some of the hitherto mysterious appendages to the telescope. He bids us notice that the polar axis (the counterpart of the tilted pillar of the simple stand), has, at its upper hand, another hollow axis, called the declination axis, attached to it at right angles. To one end of the tube moving partly inside the latter the telescope is firmly fixed, to the other a mass of metal, which acts as a counterpoise and tends to keep everything steady. Near this counterpoise is fixed at right angles to the axis a metal circle, of which either the edge or the face is very accurately divided into degrees and their subdivisions. A very ingenious contrivance, invented in 1631 by Pierre Vernier, and called by his surname, enables one to determine the value of spaces much smaller than those actually engraved on the circle, thereby considerably lessening the difficulty and cost of workmanship. These divisions are read by one or more microscopes conveniently placed. The graduation on the circle is arranged in four quarters or quadrants from 0° to 90° each, and the line joining 0° and 0° points to the celestial equator. The Verniers, for there are usually two, placed diametrically opposite each other, being attached to, and therefore moving with, the tube which passes through the hollow declination axis, and to the other end of which the telescope is attached, can be set to any part of the declination circle. By this means the telescope is set to the declination of the object sought. At the lower end of the polar axis are two other circles, one of which is movable, with their Verniers and reading microscopes; these are divided into hours, minutes, etc. The sidereal time is noted, one of the R. A. circles is set to it, and the other to the R. A. of the object, the clockwork is set going, and we can now examine the object, whatever it be, at our ease. In the more complete form of equatorial the reading microscopes, for both declination and right ascension, have their eye-pieces at the eye-end of the telescope.

(*To be continued.*)

NOTES ON VEGETABLE TERATOLOGY.

DURING the summer months the number of so-called "sports" and "monstrosities," which our kind and sympathetic readers have forwarded to us, has been immense. It is next to impossible to thank every donor, so the will has to represent the deed. At times one's study has looked like a chamber of vegetable horrors—a kind of vegetable lunatic asylum, where nearly everything had gone wrong! Of course, behind all this, lay hidden many suggestive ideas, for the naturalist is perfectly aware that a "freak" or "monstrosity" is the result of laws as imperative as those of ordinary growths. The one use we have suggested concerning specimens of vegetable teratology is that they give us possible glimpses of the phyla, or lines of genealogical descent of many of the great and powerful orders of the vegetable kingdom.

But even apart from such important matters, other "monstrosities" illustrate the laws of relationship and convertibility of the organs of plants. They prove to us how acts of specialisation have been brought about—leaves converted into floral organs or contrariwise. We give a selection of some of the many notes furnished by correspondents.

One of the most remarkable is a pinnated leaf of Salvia, sent by Doctor Newth, of Hayward's Green. It is no uncommon thing to find red or yellow leaves, but in this instance they are of a brilliant Prussian blue colour. In other words, the leaves have assumed the colour of the petals.

Fasciation seems to be the easiest way in which plants go wrong, and therefore we cannot wonder the Nat. Ord. Compositæ is the most flourishing in the world.

Mr. E. Buckell, of Romsey, sent us a very remarkable example of fasciation in a species of chrysanthemum, no fewer than seven or eight heads being fused into one, as well as their stems. The result of the compound Compositæ was a very curious corkscrew arrangement.

Mr. G. E. Cox, of Leyton, writes: "The great extent to which this eccentricity of growth sometimes extends is well illustrated by the photograph enclosed. The bulb, a very fine one, threw up two stems, the second exhibiting the same peculiarity in a much less marked degree. The one I photographed bore forty-seven flowers, which were, however, somewhat small, the extreme width of the stem was three and a half inches."

Mr. A. Mayfield, of Norwich, sent a specimen illustrative of the following note: "Upon a dahlia plant in my garden there are three or four flowers with double crowns, and another plant has a great many flowers with an abnormal growth of the bracts."

"Hulwidgeon" writes: "I am not sufficient of a botanist nor enough employed in flower-culture to be able to detect such floral freaks as I might otherwise observe; but some curiosities indicative of the sportiveness of Nature in different stages of vegetal life have been striking enough to attract my attention during the summer. I send you a note or two of them in case they may also interest you. One was a strangely-developed strawberry plucked at Woolwich last June, of which I send you the original drawings that I made at the time. The pulp had grown into the distinct form of four (so-called) "berries," which readily broke apart. There was but one stalk and calyx to it, however, and its sepals (twenty in number) were regularly arranged in a single whorl reflected upon itself by the backward pressure of the fruit. I am aware that double strawberries are no novelty, but I thought that this well-developed quadruple one was rare enough to regard as an oddity."

The cultivation of a quadruplicate strawberry variety may be worth further attention; for any horticulturist who can make four strawberries to grow where only one grew before, would not only be a benefactor to his kind, but would put money in his pocket as well!

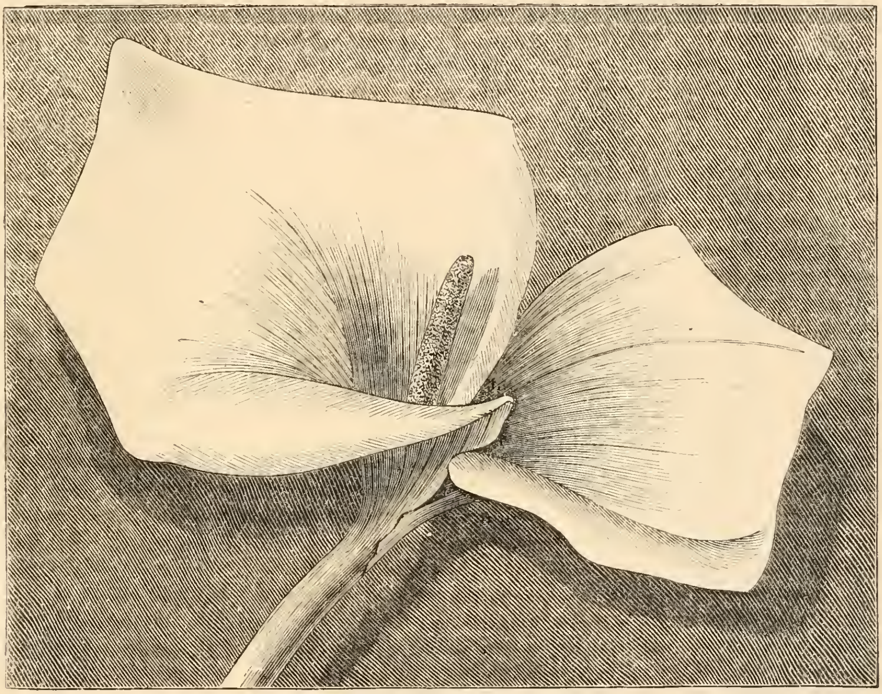


Fig. 143.—Monstrosity in Lily of the Nile (*Arum.*).

"Again: I have a large number of sunflowers of the common annual variety in my garden, and I have been struck with the remarkable diversity in appearance of their flower-heads. In some that swollen portion of the stem which forms the calyx, and embraces the flower, is bare, except for the well-known circles of sepals (lamellar scales, I believe they are called), which constitute its fringe. On others, however, appear what seem to be misplaced sepals more or less approaching in figure to the ordinary foliage. Some of the blooms appear thus encircled by a ring of leaves, and, on cutting off one head, I found no less than seven petiolate leaves dependent from its back. Others contain a less number, and one, still blowing (1st September), sustains two of

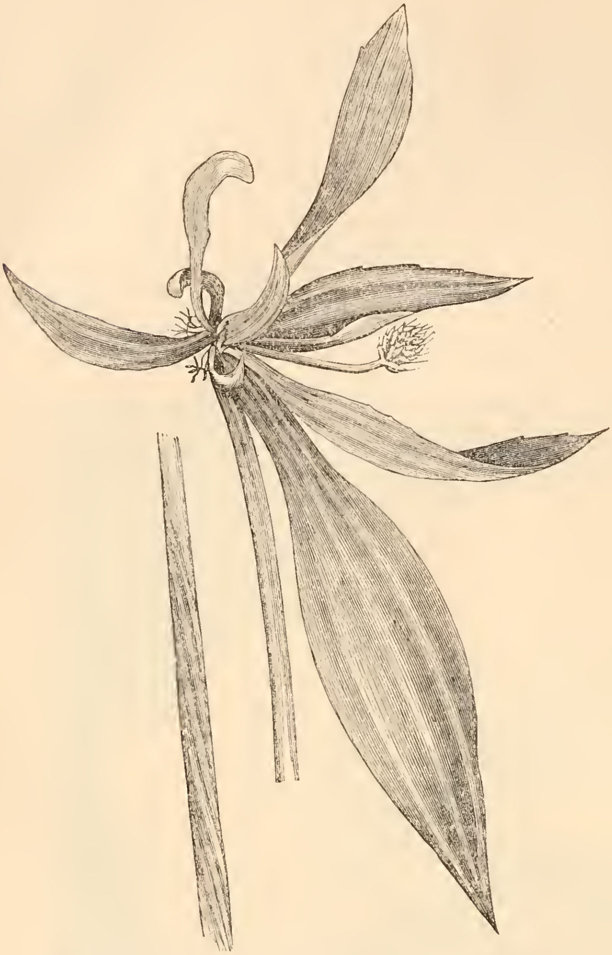


Fig. 144.—"Monstrous" specimen of *Plantago lanceolata.*

Fig. 146.—Fasciation in African Marigold.

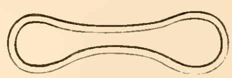


Fig. 147.—Plan of ditto.

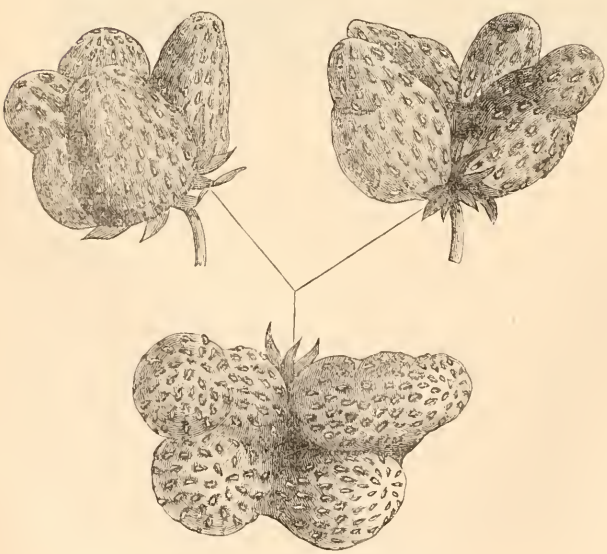


Fig. 145.—Quadruplicate Strawberries.

Fig. 148.—Green four-petalled Primrose.

such proportions that it is held rigidly upright by them. I suppose I need not add my experience that the helianthus does not follow the sun's movements, and pays him indeed not a whit more deference than do other flowers. The first blooms, being very heavy, naturally droop, and generally, as with other flowers, towards the south, but not that always even. I had one this year which turned face northward towards a high brick wall; the succeeding flowers growing round the main axis of the plant point generously in all the directions of the compass."

Mr. G. H. Bryan, of Cambridge, writes, anent the frolicsome plantago, as follows: "I enclose a sketch of an abnormal development of *Plantago lanceolata*, in which you will observe that a rosette of leaves and a small flowering spike are growing on the top of one of the peduncles. The plant from which the specimen was taken was a very fine one, and the peduncles, including the one in question, were about ten inches long."

From Foochow, in China, comes the following note: "As you seem to be noting anomalous flowering on the parts of plants, I send you a photograph herewith of a lily of the Nile. The plant only had this one double flower. Another somewhat unusual matter came under my notice quite lately, viz., a walnut with three shells, the three fissures meet at a point at angles of 110°, 110°, 140°."—*C. H. Brewitt-Taylor.*

Mr. C. Parkinson, F.G.S., says: "I enclose you two flowers of the gaillardia gathered to-day in the garden, and which appear to me to illustrate the subject of teratology which you are writing upon in SCIENCE-GOSSIP. The coloured rays appear transformed into barren florets."

Mr. H. Walmsley, of Sale, writes: "Enclosed is a sketch of a monstrous primrose which I thought might be of interest. The plant from which I took it had four more similar heads, two having four sepals, like sketch, the other two having the typical number. There were also two or three blooms on the same plant of the ordinary form. Flowers with four petals were not uncommon in the same locality."

We are much obliged to Miss M. Skelton, of Brentford, for sending a very interesting specimen of fuchsia, in which the sepals have not only reverted to the leaf condition, but have also interposed internodal spaces between them and the floral parts.

Mr. J. Ballantyne forwarded the sketch of a young plant found inside a water melon. This is not an uncommon occurrence, but corresponds to the viviparous habit in some fishes and reptiles.

J. E. TAYLOR.

DR. B. CARRINGTON and MR. W. H. Pearson announce "Fasciculus IV." (containing Nos. 216 to 290), of their *Hepaticæ Britannicæ Exsiccatæ* as being ready.

CEYLON COCOA.

By DR. A. J. H. CRESPI.

ONE of the most curious features of modern commercial activity is that Nature is, as it were, compelled to improve on her own earlier efforts. Supposing that some much-prized plant is found to do well in a particular region with a climate of given warmth and under certain recognised conditions: the next thing is to find out a region where these conditions are still better, and to introduce the plant there. This seems to have been done with the cacao tree in Ceylon, and cocoa of superlative excellence has for many years been manufactured from cacao beans imported from that beautiful island. Some brands of Ceylon cocoa have been recently commanding very high prices; this shows what a magnificent field exists in Ceylon for cocoa culture, and that the quality of the cocoa from that island is far above the average of West Indian varieties. The principal peculiarity of the Ceylon brand is its delicate flavour and rich aroma; although when prepared for use its price is not very high, and quite within reach of most incomes. We confidently predict that as it becomes more generally known it will be sold in still larger quantities, and so open up a fresh and most important branch of trade to British enterprise.

Messrs. J. S. Fry and Sons, the well-known makers, whose house was founded in 1728, were not slow to recognise the peculiarly delicious flavour of Ceylon cocoa, and they have accordingly added another luxury to our household beverages in the form of Ceylon chocolate, a speciality that is being much appreciated by connoisseurs.

While on the subject of Ceylon cocoa, we have just been favoured with some of the most recent statistics relating to the consumption of cocoa in England. Although a great authority gives the average consumption as five ounces per head, it is now ascertained to amount to eight, or, to be more precise, in 1889 it reached 18,464,164 pounds. This is not a large total after all, but marks progress. In 1820, duty was only paid on 267,000 pounds; in 1875, on 9,900,000 pounds. In other words, the consumption has doubled in fourteen years, and should the present rate of progress continue another fourteen or fifteen years, the trade will reach, for the first time, very respectable dimensions.

Considering its fragrance and nutritive properties (for all preparations of cocoa are a true food, and valuable as tissue restorers and force producers), perhaps the small consumption is surprising. For our part, we prefer well-prepared cocoa to all other beverages, while indigestion, which is so frequently caused, or, at any rate, aggravated by the too liberal use of hot tea, does not follow cocoa. The cocoa trade is in a healthy and active state, and the wants of the general public are not likely to be neglected as long as so many leading English firms are busily engaged ministering to the national needs.

One of the best uses to which Ceylon chocolate can be put is to eat it when on tricycling or pedestrian excursions. We have found it most convenient, and we believe that cyclists, who are often at a great loss for a portable and palatable food which they can eat without dismounting, will more and more trust to chocolate as their sheet-anchor. Long before our attention had been directed to the subject by a circular we were reading the other day, we had found out the value of dry and satisfying food when many miles from home and pressed for time.

Wimborne.

ODD NOTES ON PLANTS.

By J. W. Buck, B.Sc., etc.

These notes on the ways of plants do not profess to be more than the results of random observations made from time to time. I believe they are fairly correct, but young naturalists had better confirm them for their own sakes and information.

When coltsfoot is in flower it holds its blossoms straight up, or nearly so, but when the fruits are ripening the flower-heads are closed, and hang bottom upwards, the stalk having a sudden bend near the top, and looking thin and weak, as if withering. When it is time for the pappus to expand, the stalk straightens itself again, and the ball of white down is held in the original position. Dandelions also close up after flowering, and again reopen when the fruits are ready to form the "clock." Goat's-beard does the same, and the bracts of the involucre may be seen bursting out on one side, as more room is required within. It would be interesting to know how long these several changes are in taking place, and also whether a goat's-beard blossom after once closing reopens the next morning. The rate of the changes I have spoken of probably depends partly on the weather and the sun, but I have an impression that they do not take very long.

When the greater stitchwort (*S. holostea*) is ripening its seed vessels, it turns them downwards, as I believe is the case with several other plants of this order. The stalk which bore the flower turns downwards at its base until it is in a somewhat horizontal position, and near the tip of it there is a curve downwards which causes the fruit to hang upside down. *Spergularia arvensis* also turns its stalks downwards or backwards in a very striking manner.

When blue-bells (*Scilla nutans*) are looked at in the bud, by opening the young leaves, it is easy to see that the flower-stalks grow all round the main flowering-stem, but they all agree to fall one way afterwards. The weakness of the stem makes it bend downwards with a curve, but if looked at in the autumn, when the capsules are ripe, or are burst, it will be seen to be erect, and the capsules to be standing as upright as they well can, and, I believe, arranged indifferently around the stem. Foxgloves bring their flowers all round to one side of the stem, though not invariably, and thus present the appearance of a front and a back; but it is easy to see that the flowers are really attached all round, and in the cluster of undeveloped flowers at the top they still keep their original positions. But it is not easy to see why they should turn to one side more than to another, or what it is that determines that side. They do not appear to face the sun, though on the other hand they generally turn away from a wall or hedge, the consequence being that they generally face the spectator. Cowslips resemble blue-bells in the fact that their flowers hang more or less downwards when out, and that later in the year the umbels may be found standing upright, all the smaller stalks clustering together so that all the calyces point upwards, and it seems as if when the capsules at the bottom burst, the seeds would have no chance for a time of getting away. In the water avens too (*Geum rivale*), the flowers hang down, but the clusters of ripe achenes are erect. Poppy buds hang down, but their change to the upright position takes place when the flowers open, and the capsules remain upright. Dog's mercury comes up through the ground with the tips of its stalks bent completely back, and straightens itself afterwards.

White clover, on the other hand, is a case where the flowers look upwards first and downwards later on. If a head of white clover be gathered when about half its flowers have gone off, it will be seen that those now in blossom, and those still to come, cluster round the upper part and grow more or less in an upward direction, while below these are others, turning brown and withering, which are bent downwards, the difference in position of the two sets being very marked. Here again it would be interesting to know how fast these changes take place. The umbels of carrot close up quickly after their flowering.

Several, if not all, of our English geraniums put their flowers through movements of a somewhat peculiar kind as the seeds ripen. The common plan seems to be as follows: The flowers grow in umbels of two each, and at first their stalks are small and very noticeable. After the corollas have fallen, the secondary stalks for a time turn sharply downwards at their origin, with a bend a little further along which brings the rapidly lengthening fruit-head into its normal position. Lastly, as time goes on, they straighten once more. All the stages in succession I have seen on a bit of *G. molle*. *G. dissectum* also shows the same kind of thing, together with stork's-bill (*Erodium cicutarium*). I am not certain whether the same applies to Herb Robert or not.

I have observed the leaves of the ash falling, or fallen. In that instance, at all events, the leaflets fell from the leaf-stalk singly, and afterwards the bare leaf-stalk came down. Whether this is commonly the case I cannot say, but it has a practical connection with the question of what are compound leaves. I used to understand that a compound leaf fell as a compound leaf.

Laburnum trees this year put forth a second crop of blossoms. They have most likely done so before. The second bunches of flowers were small, and few in number, and they seemed to be of a rather deeper colour than the first. They hung on the trees for a long time.

SCIENCE-GOSSIP.

"Through Magic Glasses" is the title of a new work from the pen of Arabella B. Buckley (Mrs. Fisher) which Mr. Stanford has nearly ready for publication. It will be a sequel to the same author's "Fairyland of Science" now in its 23rd thousand, and will have numerous illustrations.

Dr. James Croll is once more in the field with a new work, to be entitled "The Philosophical Basis of Evolution," which Mr. Stanford will publish shortly, uniform in appearance with the other works from the same pen.

One of the most useful contributions to British Botanical literature is the "Annual Report of the Botanical Exchange Club." That for 1889 is just to hand, and contains very useful notes as to the habitats of rare plants, new varieties, etc.

We give the following information for what it is worth. It is a dodge for converting one's watch into a pocket compass, and therefore if it turns out correct, it is a very useful tip.—Point the hour-hand of a watch to the sun, and the south is exactly half-way between the hour and figure XI. on the dial. For instance, suppose that it is eight o'clock, point the hand indicating eight to the sun, and the the figure X. will then be due south. Of course, we are referring to the experiment as relating to the orientation of the Northern hemisphere; one would like to hear the opinion of some Australian scientist as to how he would make the experiment practically available for the Southern hemisphere. Most men carry watches who do not possess compasses, and if his watch can be made to do double duty, all the better.

MICROSCOPY.

A new Clearing Agent.—The July number of Science-Gossip has reached me to-day—26th August, and I find it contains my note on this subject. I also observe that I omitted to state that in many cases, especially where milkiness is obstinate in an object, it will be found advantageous to transfer the object from the carbolo-turpentine to pure spirits of turpentine. The latter may have to be changed once or twice if used in small quantities, but it removes all traces of milkiness, and of course further fits the object for the balsam. This method of mounting will be found expeditious, and for most objects quite satisfactory.—*W. J. Simmons, Calcutta.*

ZOOLOGY.

Cocaine in Scorpion Stings.—Assistant-surgeon Hari Datt Pant, of Srinagar in Garwal, writes to the "Medical Record" here, to say that he injects cocaine hydrochlorate (½ to 1 grain in 10 to 15 drops of water) hypodermically, at or near the seat of the sting, with the result that the pain is gone before the nozzle of the syringe is withdrawn. A fresh solution acts better than one long kept. Mr. Pant has used it in nearly one hundred cases, and no untoward symptoms have ever resulted from it. He says that during May, June and July, scorpions abound in Srinagar, particularly after a stormy or rainy evening. Between seven and nine groups of boys may be seen in almost every street, armed with a lantern, a pair of tongs and a black bottle, searching for scorpions! A village a few miles from Srinagar was deserted simply owing to the scorpions in it. The natives often resort to *jogis* (devotees) and *chamárs* (a low caste from which shoemakers, tanners, etc., are drawn) who are reputed to relieve the pain of scorpion-stings by *mautras*, and who do sometimes alleviate it by the skilful massage which accompanies the muttering of the charm. But cocaine is growing in public estimation, and is preferred by most to the *mautras*. Your readers must not suppose that all India, like Srinagar, is overrun with scorpions: many people who have been here for years have only seen the pickled specimens in museums; and it is well to note this, because the old belief entertained by many, that in most parts of India tigers prowl around like dogs, and that you have to shake cobras out of your boots every morning, whilst centipedes, scorpions, etc., are as common as flies, is on a par with the popular notion that every drop of water in creation is a teeming world of "animalcules"!—*W. J. S., Calcutta.*

BOTANY.

Crepis Taraxacifolia.—Sussex botanists will be glad to hear that *Crepis taraxacifolia*, a plant not hitherto recorded as occurring in this country, was in June last discovered growing in considerable abundance at Willingdon, near this place. There cannot be the least doubt about the identity of the plant, as a specimen was submitted to Mr. Baker, of Kew, and the finder has his high authority for saying that the species is certainly taraxacifolia. I observe that in your August number you give an illustration of an abnormal form of cabbage leaf. This is very curious, but I last summer found four precisely similar leaves on a cabbage-plant at Jevington, near here. These leaves, which were situate about three inches above the root (the lowermost leaves were normal in character), formed a sort of whorl, the several leaves being at equal distances from each other.—*R. B. P.*, *Eastbourne.*

Vegetable Teratology.—I noticed this week in a garden at Ashton-under-Lyne several examples of fasciation in the stem of *Tropæolum majus.* In one instance the flattened united mass was nearly an inch broad, and was apparently the result of the fusion of three distinct stems.—*J. A. Wheldon.*

Dr. Braithwaite's "British Moss Flora."—Part 13, being the first number of the second vol. of this remarkable work, is just to hand. It deals with the families Splachnacæ, Oedipodiacæ, Funariaceæ, and Bryaceæ, and is illustrated with six exquisitely finished plates, giving details of structure, etc., of the mosses described. This is by far the most thorough and exhaustive work on British mosses ever published, or likely to be for many years to come.

The Pinks.—The very interesting account of the discovery of the Cheddar pink near Guildford leads me to suggest that further search should be made for it in the district adjacent. The pinks, especially the annual species, are very capricious in their appearance. Can any one account for this? For four or five successive years I noticed the pretty *Dianthus armeria* in abundance at Racton, in a particular locality, but of late have been unable to find a single example there, although I am glad to say it is still found in a distant part of the parish. At a station about three miles whence I am now writing, but forbear to mention, *Dianthus prolifer* occurred in hundreds this year, occasionally not more than three inches in height: but, occasionally, it is scarcely to to be met with at all. I should like information as to why the Cheddar pink is considered the parent of the family.—*F. H. Arnold*, *The Hermitage*, *Emsworth.*

NOTES AND QUERIES.

Colours of Shells.—As I take an interest in the subject of colour, I should be greatly obliged if Mr. Williams would give me references to "the few who have written on the subject" of the colour of shells.—*E. A. Barnes.*

Acarus and Bombus.—Can any one inform me if a species of acarus found on *Bombus terrestris* kills this insect? I found two on a dead bee, of which I kept one for three days, during which three bombi, put in the same box with it, died.—*W. H. Seyfang*, *The Cedars*, *Maidstone.*

Query about a Poppy.—I have gathered a poppy which I cannot identify, and which I am at a loss whether to consider as a hybrid or a distinct species. In form of capsule, colour of petals, and general appearance it is like *P. Rhœas*, but the hairs on the stem are closely pressed as in *P. Dubium.* I have gathered from three different localities near Northampton specimens of the same.—*E. M. Westley.*

Fasciated Stems.—Dr. J. E. Taylor might be glad to know that I observed a fasciated stem of the sycamore, and also orange-lily this summer. I also observed once a red moss-rose with another growing from its centre; and I had a specimen of Lathyrus in my garden, the stems of which were extraordinarily fasciated.—*S. A. Brenan.*

Seaweeds.—A. H. B. (p. 214) points out that Peveril Point, Swanage, is an excellent hunting-ground for seaweeds. Will he kindly give the names of the less common species he has found there, whether with reproductive organs, and the month.—*T. H. B.*

Helix lamellata in Ireland.—Your correspondent, J. R. B. Mansfield, in the August "Gossip," in his very interesting letter about the Mollusca, &c., of N. Stafford, mentions that district as the southern limit of *Helix lamellata;* it may interest him and others to know that in Ireland its distribution ranges somewhat farther south. Near Clonmel, in the south of co. Tipperary, and some forty or fifty miles south of Cheadle, from which Mr. Mansfield writes, this shell is found in abundance. In almost any of the wooded glens, on either side of the R. Suil, *i.e.* in co. Waterford, or co. Tipperary, a handful of decaying leaves taken at random would be almost sure to provide specimens. I fancied that it specially loved the débris under the rhododendron. The shells usually found with it were, *Hy. crystalina* and *Carychinus minus.* I believe that I took *H. lamellata* in Killarney three years ago, but cannot lay my hands on the specimens.—*Alex. H. Delap.*

Colouring of Eggs.—I am glad to find that Mr. Nunn is able to confirm the accuracy of my statement that eggs of sea-fowl do occasionally occur with the bulk of the colouring at the smaller end. I also think it is of more frequent occurrence than Mr. Nunn seems to imagine, as several examples of such varieties have come under my notice. Some time ago Mr. William Hewitt, of York, who possesses a very fine series of seabirds' eggs, and visits the breeding stations every year for the sole purpose of selecting varieties, informed me that he occasionally came across such forms; and it is very probable that he has examples in his cabinet. It seems to me very unlikely that such an egg as that of the guillemot should be turned or reversed after once entering the oviduct, but never having dissected the bird, and having a very superficial acquaintance with ornithological anatomy, I would certainly not venture to state that such a thing was impossible—therefore I leave Mr. Nunn's theory to those most qualified to discuss such matters, being content to have brought to notice this slight emendation of the facts upon which it is based.—*J. A. Wheldon.*

Late Appearance of the Swift (*Cypselus apus*).—On the evening of Sept. 24th, which was fine and mild, the wind being southerly and soft, three swifts were vigorously hawking about in the village of Killingworth, near Newcastle-on-Tyne. On the day previous I had also observed a swift flying, as well as one on Sept. 1st. Never before have I observed swifts so late in the year, though keeping a watchful eye on natural phenomena.—*Charles Robson.*

Scarcity of Wasps (Vespæ).—In the spring and early summer I detected very few of the hibernated queen social wasps on the wing; nor have I observed a single worker during the entire summer—either in this neighbourhood or at Birtley, Durham, during a ten days' stay at the latter place in the end of July and beginning of August. Until this month (Sept.), indeed, I have not seen a wasp of any sort or sex since the queens of spring; when, on the 2nd, I observed a queen (*Vespa rufa*); on the 3rd a male (*V. sylvestris*), and on the 15th and 18th respectively, a solitary worker (*V. rufa*).—*Charles Robson.*

Re Helix Hortensis, var. Trochoidea (Clessin).—I hope Mr. Williams will kindly allow me to correct a slight error or wrong impression he inadvertently made in your last issue. My specimen was taken in July of last year at Simonstone, Lanc. and not at Clayton-le-Moors, as Mr. Williams indicated.—*R. Wigglesworth.*

An Aquatic Garden in New Zealand.—Reading in your June number of Science-Gossip an interesting account of an aquatic garden near the Malvern Hills, I was reminded of a very similar one, though perhaps not so complete in matters of detail, at Opawa, a suburb of Christchurch, N.Z., that I had the pleasure of visiting in the early part of this year. The Troutdale Farm, at Opawa, is not of many acres in extent, but the owner, Mr. Johnson, has made it one of great interest and pleasure, not only to lovers of the gentle art, but also to the lovers of nature. The water that flows through the zigzag canals, cut through the tenacious clay with sluices of wood here and there, partly filled with shingle from the stony bed of the river, and again widening into small ponds in which many pieces of trout are reared among the aquatic plants that have been brought from England, America, and other parts, the different species are all kept separately, and this is arranged almost as easily as the sheep are managed on a farm. The water is supplied by means of Artesian wells through pipes, some of which are driven to considerable depths, the water from certain depths having to fall out of the pipe several feet and then over two or three artificial falls before it is sufficiently aerated for the fish to live in. You also see the fish of various ages in their respective homes, and it is really wonderful, when standing near a small pool, not a sign of living fish to be seen among the free-growing plants, when a spoonful of food is dropped in, the water seems in a moment to be alive with fish. I think one of the most beautiful of the trout species is "Fontinalis" American brook trout, though it does not attain the size of the English trout. Mr. Johnson showed us some beautiful fish that he had produced by crossing the English trout with Fontinalis, the hybrid being always fit for table purposes, and its markings were peculiar and very beautiful, the spots appearing to have run together, resulting in stripes something like those on a tabby cat. There were some eight of the Artesian wells constantly flowing, thus keeping up a sufficient supply and to spare. In some ponds were perch enjoying themselves among the stems of the beautiful *Aponogeton distachyon*, with its sweet-scented flowers, the banks covered with the yellow musk and many other varieties of mimulus, in another part the American carfish; gold and silver fish in another, and what is quite a new style to us at this far-away corner of the globe, frogs and tadpoles lazily moving about—a few N.Z. molluscs, but the kind principally to be seen is *Limnia stagnalis*, which increases here at a marvellously rapid rate. Among the numerous aquatics are Anacharis, which has in a few years become quite an obstruction to the boating on the beautiful river Avon that seems to flow all round Christchurch. The strange *Vallisneria spiralis*, and a plant brought by Mr. Johnson from one of the island lakes, Nitella, a plant most useful in oxygenating water. I trust I am not writing too long a description, but I was delighted with my visit to Troutdale, and brought away to my home in the North Island a few of the fish, not omitting the tadpoles, in the hope that, on a small scale, I may keep up a pleasant reminder of my visit south, although we have not the Artesian water, I have utilised a small perennial spring. Seeing the paper by Mr. Carter, induced me to send you this, thinking it might surprise as well as please you to know that here in New Zealand besides the rearing grounds of the Acclimatisation Societies, there is one something like that near Malvern Hills from which many thousands of young fish are annually sent through this well-watered country.—*Jas. W. Baker, Brookdale, Wanganui, N. Zealand.*

Banded Cochlicopa Lubrica.—On the 3rd of October, just ended, I picked up a banded live shell of the ovate form of this species at Clayton-le-Moors, and, as no manual to which I have access has placed this on record, my conchological friends will kindly pardon me for appending the following description. Shell, ovate, greenish, more opaque; spire shorter, duller, with a faint, narrow band of a darker hue above the periphery of the last and penultimate whorls.—*R. Wigglesworth.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

S. W. B.—The specimen you enclosed was too obscure to make out. It seemed to be a lichen rather than an algæ; or it might be the first or mycelium stage of some fungus.

J. Fletcher.—Many thanks for your teratological specimens of wood-avens and knapweed, both of which shall receive due attention.

W. A. Smith.—The growths on oak-leaves are common, and are caused by insects, species of cynips. They are therefore galls, and go by the name of "oak-spangles" and "buttongalls." For figures and descriptions, see Taylor's "Playtime Naturalist" (Chatto & Windus, price 3*s.* 6*d.*).

W. SAMPSON requests the names of any papers, books, &c., treating on the egg and larval stages of the coleoptera.

EXCHANGES.

FRAGMENTARY rhætic shark spines, nemacanthus and hybodus, offered for other fossils.—T. Stock, 16 Glen Park, Eastville, Bristol.

OFFERED, Erasmus Darwin's "Phytologia," first edition, quarto, boards; Darwin's "Zoonomia," second edition, two vols., quarto, calf; also SCIENCE-GOSSIP for 1884 and 1889. What offers?—H. Roberts, 60 Princess Road, Kilburn, London.

DREDGINGS containing a beautiful variety of shells, forams, also drift containing a rare variety of shells, echinii spines, micro offers, &c. What offers?—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTING a secondhand silver watch to present to a lad, I will give in return rare British shells, fossils, polished geological specimens (correctly named and localised), or microscopic objects.—T. E. Sclater, Bank Street, Teignmouth, Devon.

SCIENCE-GOSSIP, complete from commencement, good condition; vols. 1 and 2 bound. What offers?—Adlington, Boughton Fields, Worcester.

WHAT offers for a Powell and Zeland's improved microscope (monocular), in case, with all accessories, polarizing apparatus, &c.: original cost 100*l.* Apply for particulars to Mrs. George Glossop, Newland House, Twickenham.

WANTED, Braithwaite's "British Moss Flora," any parts except first five, in exchange for books, flowering plants, mosses, &c.—J. A. Wheldon, 32 Langham Street, Ashton-under-Lyne.

ROSSALL SCHOOL.—Will any one kindly help to stock a museum in this school? Natural objects of all kinds are wanted. Cost of packing and carriage will, of course, be paid. —R. A. Clarke, Rossall School, Lancashire.

I HAVE numerous duplicate fossils for exchange: from the red crag, tellina, turritella, purpura, &c.; from the chalk, inoceramus, terebratula, micraster, ananchytes, &c.; from Portland, oolite, trigonia, ostraca,&c., and others. I want Cambrian, Silurian, and Carboniferous fossils, especially the last-named. Should be glad to hear from collectors in the northern counties. —Edwd. A. Martin, 21 Carew Road, Thornton Heath, Surrey.

OFFERED, clutches of black-headed gull, bullfinch, Arctic and common terns, carrion crow, chaffinch, hooded crow, jackdaw, eggs of tree sparrow, lapwing, coot, sandpiper, curlew, eider duck, black-footed penguin. Wanted, osprey, hobby, merlin, chough, crossbill, &c.—F. W. Paple, 62 Waterloo Street, Bolton.

WANTED, insect cabinet. Offered, British marine shells, collection of star-fish, all well preserved and ready mounted for cabinet. Full particulars to W. D. Rae, 9 Claremont Terrace, Alpha Road, Millwall, London, E.

WHAT offers for sixty British birds' eggs, including redwing, shrike, guillemot, coot, moor-hen, pheasant, partridge, swallow, spotted crake, black tern, sandmartin, linnet, titmice, buntings, warblers, magpie and jackdaw, &c. — Miss A. Glossop, Twickenham.

WANTED, London clay and other tertiary fossils. Cambrian, ordovician, silurian, and volcanic rocks given in exchange. Lists exchanged. — W. H. Banks, Ridgebourne, Kington, Herefordshire.

THE "Playtime Naturalist," "Robinson Crusoe," works of Mrs. Hemans, all well-bound books, and in good condition. What offers?—Richd. B. Corbishley, Poulton-le-Fylde, Lancs.

Vertigo pygmæa, Bulimus obscurus, Bulimus acutus, vars. *strigata* and *bizona, Pupa marginata*, and *Helix ericetorum*. Wanted, other land or freshwater shells.—Cairus, Queen Street, Hurst, Ashton-under-Lyne.

SMALL collection of about seventy copper and silver coins, tokens, &c., including 1842 American cent., 2 Anticosti, Chinese, Roman, Hungarian, curious Afghanistan, Old Irish, &c., also quantity of foreign stamps. Desiderata, section cutting-machine, minerals, micro material, cabinet specimens of crustacea, or Plattner's "Work on the Blowpipe." First good offer taken. — H. Durrant, 4 Boulton Road, West Bromwich.

WANTED, *Pisidium roseum, Helix revelata, H. fusca, H. pygmæa*, and *Bulimus montanus*, in exchange for *Hydrobia ulvæ, H. ventrosa, H. Jenkinsii*, and *Helix pomatia*.—L. O. Grocock, M.C.S., 13 Lower Maryon Road, Charlton, Kent.

OFFERED, *V. cristata, P. lineatus, contortus, L. glutinosa, S. elegans*, &c. Wanted, *H. fusca, V. antivertigo, Z. purus*, and others not in collection.—A. A. Moore, 20 Fernlea Terrace, Harwich.

BULBS of *Gladiolus gaudavensis*, many varieties, in exchange for bulbs of named narcissi, lilies, tigridias (white), sparaxis, babianas, &c.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford, Ireland.

WANTED, Yarrell's "History of British Birds," 4th edition. Offered, H. C. Lang's "Butterflies of Europe," unbound, "Entomologist," 1885, bound.—Oliver A. Weiss, 87 Harborne Road, Birmingham.

WANTED, British marine shells not in collection. Offered, British marine. Foreign correspondence invited.—E. R. Sykes, 13 Doughty Street, London, W.C.

OFFERED, *Z. nitidulus, Z. crystallinus, Z. purus, Balea perversa, Clausilia rugosa*, var. *dubia, Pis. nitidum, L. peregra*, var. *acuminata, Ancylus fluviatilis, Limnæa truncatula, L. palustris, M. decollatum*, &c. Wanted, *H. fusca, H. cartusiana*, and other shells.—A. Whitworth, 65 Talbot Street, Southport, Lancs.

WANTED, uncut pathological material, slides, books, papers, &c., relating to the science of pathology, or microscopical accessories, in return for histological slides and material.—F. G. Jones, Department of Medicine, University of Pa., Philadelphia, Pa., U.S.A.

OFFERED, a great number of rare microscopical, optical, and mathematical books. air-pump for mounting, &c. Wanted, objectives, or good Jackson stand.—Taylor, 26 Marchmont Street, London, W.C.

A COLLECTION of eocene fossils, named and localized, comprising 100 species, 1000 specimens. Exchange for electrical apparatus, perfect terebratulæ, or offers.—E. H. V. D., 1 Adelaide Terrace Bournemouth.

DUPLICATES.—*H. lamellata, H. fusca, P. ringens*, &c. Desiderata, *P. nitidum, roseum, L. involuta, Suc. virescens* and *oblonga, H. obvoluta, A. lineata*, any of the vertigoes except pygmea and edentula.—T. A. Lofthouse, 67 Grange Road, Middlesborough.

WANTED, foreign shells in exchange British marine, land and freshwater shells, and choice microscopic slides of every description. Foreign correspondence invited.—Richard Suter, 5 Highweek Road, Tottenham, London.

WANTED, any named varieties of *Helix aspersa, nemoralis, hortensis, arbustorum, cantiana, pisana, virgata, caperata, ericetorum*, &c., in good condition. Offered, *Helix pygmæa, Pl. nautileus*, var. *crista*, and very many others.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorks.

THE medical and pharmaceutical students' collection of specimens, 120 packets, all named. Will exchange for store boxes, setting-boards, natural history books, or what offers?—W. L. Balmbra, The Cottages, Warkworth Station, Lesbury, Northumberland.

FOR exchange, L. C., 8th ed.: 175, 260, 541, 691, 784, 914, 965, 1034, 1034 + sepium, 1070, 1088, 1089, 1098, 1100, 1248, 1256, 1398, 1438, 1770*d*, and many others. Desiderata numerous.—R. A. Phillips, Ashburton, Cork.

GOOD pathological sections, larvæ of ant-lion (Ceylon), and some Ceylon beetles, scarabæidæ, to exchange for mounted slides, insects, or micro material.—Dr. Clements, Frindsbury, Rochester.

DUPLICATES.—*Cyrena Tuminalis, Pupa ringens, turritella, Rissoa violacea, otina, Japes aureus* and *virgineus, pectunculus*, &c. Wanted, exotic mollusca. Foreign correspondence invited.—Brockton Tomlin, The Green, Llandaff, S. Wales.

BOOKS, ETC., RECEIVED.

"Inorganic Chemistry: The Chemistry of the Non Metals," by J. O. Benttler, M.A. (London: Reffe Bros.).—"Fresh-Water Aquaria," by Rev. G. C. Bateman (London: Upcott Gill).—"Our Fancy Pigeons," by Geo. Ure (London: Elliot Stock).—"The British Moss Flora," by Dr. Braithwaite, Part 13.—"Report of Bot. Exchange Club for 1889."—"Report Penzance Nat. Hist. Soc., 1889-90."—"Report City of London College Science Soc."—"American Spiders, and their Spinning-Work," by Dr. McCook, vol. ii. (published by the author, Academy of Nat. Science, Philadelphia).—"Sound, Light, and Heat" (elementary stage), by J. Spencer (London: Percival & Co.).—"Pasteur and Rabies," by T. M. Dolan, M.D. (London: G. Bell & Sons).—"The Natural Food of Man," by E. Densmore, M.D. (London: Pewtress & Co.).—"Proceedings of the Bristol Naturalists' Soc."—"Report of Penzance Nat. Hist. and Antiquarian Soc."—"W. P. Collins' Catalogue of Scientific Books, &c."—"W. Wesley & Son's ditto."—"Le Diatomiste."—American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"Insect Life."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope," &c., &c.

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

ASTRONOMICAL OBSERVATORIES AND WHAT IS DONE THERE.

By F. W. LEVANDER, F.R.A.S., etc.

Part II.

THE more we see, the more we want to see, and at various times our friend presents to our astonished gaze sun, moon, planets, stars, and those wondrous whisp-like things we call nebulæ. If we wish to feast our eyes with views of the planets, one, or, perhaps, all of the most interesting of that class — Mars, Jupiter, Saturn—may be above the horizon. In Mars we see, as has been happily remarked, the counterpart of our own earth. Up to recent years it was thought to be unattended by any satellite, but in August 1877, two tiny moons were discovered. That the planet itself has an atmosphere is evident from the fact that when, owing to the inclination of the plane of its orbit to that of the ecliptic, the sun shines more directly on either of its poles, the winter snows which have accumulated there gradually disappear, to be again renewed in due course. Other markings there are that are permanent, corresponding to our land and water; all these have received the names of former or living men of science. By observations of these streaks and spots, the time of the planet's rotation on its axis has been found to be a little more than 24 hrs. 37 min. Under certain circumstances the existence of these markings can be observed with very small optical power—the writer has seen that there *are* such spots with an object-glass of only one and a half inches in aperture; with even a six-inch glass the polar snows appear intensely bright. The planet's diameter is about half that of the earth and its mean distance from the sun about 140,000,000 miles.

The appearance of Jupiter is very different from that of Mars. On his surface we see grey (and sometimes other coloured) streaks or belts, which vary in size, shape and position, but are always more or less parallel to the equator of the planet. His four moons, appearing sometimes on one side of him, sometimes on the other, now passing over, and again hidden, by his disc, owing to their motion round their primary, are always objects of interest to a young astronomer. To observations of these comparatively small bodies, and to Römer's investigations of them in 1675, is due our knowledge that light is not instantaneous in its movement. We now know that its speed is not far short of 190,000 miles per second. The mean or average distance between the sun and the earth is about 92,000,000 miles, that between the sun and Jupiter about 483,000,000. As both planets are continually moving round the sun, their relative distances are of necessity constantly varying. The light which emanates from the sun and illuminates Jupiter's satellites, and is by them reflected to the earth has accordingly to travel over distances ranging, roughly speaking, from 400,000,000 to 580,000,000 miles. The fact that the observed times of their motions across and behind the disc of their primary—their transits and eclipses—were not in accordance with those obtained by calculation, led to the abovementioned discovery.

To see Saturn at his best such a concatenation of favourable circumstances is required as seldom occurs in our climate. But if we are fortunate enough to meet with a really good night, what a glorious, allrepaying sight he is! A huge ball, surrounded by rings and attended by a retinue of no less than eight satellites, and who can say that even that large number is not within the truth? The larger the telescope, the more light we can collect, the more shall we be able to discern in this magnificent object. The ball itself, which is 75,600 miles in diameter, (nearly 14,000 miles less than that of Jupiter), is crossed by many belts and streaks, varying in position and magnitude but always, like those on Jupiter, parallel to the equator. Its axial rotation is accomplished in a little over, and that of Jupiter in a little under, ten hours. In observing such faint objects as the markings on Saturn and on his rings, it is the goodness of the observer's eye that tells as well as the excellence of the instrument. Some persons have much keener vision than others; the mantle of the "eagle-eyed" Dawes seems to have descended on Mr. Isaac Ward, of Belfast. It must be remembered, too, that it is always easier to see what is known to exist than to make its first discovery. Saturn's rings may well be reckoned among the most wonderful sights in the heavens. What those remarkable appendages consist of no one knows; in the opinion of some astronomers they are composed of an enormous number of small satellites, so close together that owing to the great interval that separates us from Saturn (his mean distance from the sun is more than 886,000,000 miles), we are unable to discern them as separate objects. Whatever their composition may be, we know from actual observation that these rings are very thin. For convenience sake, that which is outermost is designated A, the next B, and the next C. The existence of these rings was first made known by the observations of Christian Huygens in 1659. The outside diameter of A is no less than 172,240 miles, and the inside diameter of C, 92,000 miles. When the air is very clear and a powerful telescope is employed, A and B are found to have numerous streaks on their surfaces, in fact A is—at any rate apparently—permanently divided by at least one black space, which is not by any means a difficult object even in a small telescope. Owing to the combined motions of the earth and Saturn, these rings present different aspects to us at different times. All the planets do not move in their elliptic orbits round the sun in the same plane. If we were to make an Orrery, or mechanical arrangement to represent the motions of the planets round their primary, it would not be correct to place them in such a way that imaginary lines drawn from the centre of the sun to that of each of the planets should all be horizontal. Some would have to be inclined more, and others less, to this horizontal line, for the orbits of all the planets are not in the same plane. It is, therefore, evident that we shall see sometimes the northern, sometimes the southern, side of the rings, while at other times they will appear edgewise. All the phenomena, from their widest opening, to their becoming almost—under some circumstances quite—invisible on account of their edgewise presentation, are gone through for each side of the ring in about fifteen years, that being half the time spent by Saturn in moving round the sun. In certain positions the rings will appear to be almost parallel to the belts on the planet itself, and it is most probably due to this fact that our acquaintance with ring C is of so short a duration. It is not bright, as A and B are, but very faint, and the body of the planet can be seen through it. From this peculiarity it is generally known as the crape or dusky ring. Very little was known of it till it was observed by W. Bond, in America, on the night of November 11th, 1850; a fortnight later, but before Bond's discovery was known in England, Dawes saw it. It was not, however, till nearly two years afterwards that the fact of its being transparent was established. Traces of it had apparently been noticed two hundred years previously, but its annular nature was not then established. It is most obvious where it crosses the planet itself, and on this brighter background has been frequently seen with the little one and a half inch object-glass previously mentioned. Few telescopes will show all Saturn's moons in all parts of their orbits. Titan, the largest and the first to be discovered (by Huygens in 1655), is very conspicuous; some of the others are exceedingly faint, and their surfaces do not appear to have the same reflecting power. Though anxious to see all that is possible in the Jovian and Saturnian systems, we must remember that a certain amount of light is necessary to ensure good definition. The deeper the eye-piece is, the more contracted is the field and the more conspicuous and troublesome is any defect in either the telescope or its mounting. We must not, therefore, yield to the temptation of overpressing our magnifying power. Eye-pieces which give a magnification of about fifty to the inch of aperture will usually give the most satisfactory results, though no absolute law can be laid down.

Having viewed Mars and the "giant planets" Jupiter and Saturn, which are telescopically the most interesting of their class, we might wish to pursue our investigations and examine the remaining planets. Mercury is best seen in the daytime, for, since his mean distance from the sun does not much exceed 35,000,000 miles, he never appears sufficiently far from his primary to be well seen either before sunrise or after sunset. Nor does he with a diameter of only 3000 miles present a large disc. Venus, too, is best seen by daylight, though not entirely for the same reason, for her distance from the sun is more than 67,000,000, and her diameter 7480 miles. Owing probably to some peculiarity in her atmosphere, she reflects so much of the light that she receives from the sun that when she is most brilliant to the naked eye—and she can then be easily picked up by the unaided vision in the daytime, if her position is known—she is not able to be well seen on the darker background of the morning or evening sky, and at other times her disc is comparatively inconspicuous. Both these planets, being "inferior," or nearer the sun than the earth, present phases similar to those of the moon. Beyond this there is not much to be made out on either.

We now come to planets not known to the ancients. William, afterwards Sir William, Herschel, who in later years became so celebrated for his large telescopes and the work that he accomplished, noticed in 1781 a peculiar object that he at first imagined was a comet. It was however soon found to be another planet, to which the name of Uranus was afterwards given, and the solar system was by this discovery at once extended to a distance of 1,780,000,000 miles. In more recent years four moons have been observed to accompany him. His distance from us is so great that, although his diameter is 30,000 miles, not much can be seen on the surface even with the largest telescopes. The same remark applies, but in a greater degree, to that which is, as far as our knowledge extends at present, the most distant planetary member of our system—Neptune, 1,000,000,000 miles more remote from the sun than Uranus, with a diameter of 37,000 miles. We know very little about him and his solitary moon. It is more than probable that we are not yet acquainted with all the satellites of these distant planets. The circumstances attending the discovery of Neptune are most remarkable and most interesting. It can be easily imagined that when astronomers are made aware of the appearance of a heavenly body in a part of the sky where it is known not to have been previously visible, very little time is lost in endeavouring to find out all that is possible respecting the stranger. Consequently, when the body discovered by Herschel—not by chance, be it remembered, but in the course of a systematic series of observations—was found to be in motion round the sun, mathematicians at once set to work to find out its orbit, from which the place occupied by it at any time either before, or after, its discovery could be determined. This having been done, it was found, though not till many years had elapsed, that the planet was not pursuing the path that theory had marked out for it. It was evidently being attracted, or dragged out of its course, by some as yet unknown body; for, according to the conclusion arrived at by Newton, every particle of matter in the universe is attracted by every other particle in a certain manner depending on their mass and their distance. The question now to be answered was, What and where is the body which is dragging Uranus out of his course, and what is its mass? In the calculation of its orbit all the effects of this nature which could be produced on it by planets nearer the sun than itself had been taken into account. From a certain apparent law of progression in the distances of the known planets from their primary, it was assumed that the unknown body must be much more remote than Uranus. The solution of the question involved extreme difficulties; these, however, were surmounted almost simultaneously by two very able mathematicians, each working quite independently—Adams in England and Leverrier in France—and the place of the stranger having been theoretically determined, it was found in almost that identical spot by the telescope. This discovery took place in 1846. A noble triumph, truly, of mathematical skill and a noteworthy instance of a dogged pursuit of knowledge under great difficulties, worthy of all praise.

Between the orbits of Mars and Jupiter it was long noticed that there was an unaccountable gap. This is now found to be occupied by a considerable number of minor planets, about three hundred of which have been discovered within the last ninety years. From their very minute size they are not, telescopically, objects of interest to the ordinary observer.

As the eye-piece is merely a small microscope employed to enlarge the image formed in the focus of the object-glass or mirror, a number of these appliances is always supplied with every telescope, and the observer can select the one that best suits his purpose. The deeper the eye-piece, the larger will an object appear if it has a disc or occupies an appreciable space. But the case is different when we view the stars. For, though they are of enormous size, they are at a still more enormous distance, and with no increase of power can they be made in a good telescope to appear much other than points. Indeed, the better the instrument is, the smaller are the star-discs.

Having exhausted the list of planets, it will be worth while to turn our attention to what are commonly known as fixed stars, so called, not because they are immovable, but because they are not wanderers or planets. Still relying on the better knowledge of our friend, we shall probably be shown first some of the stars in the more familiar constellations; and then others which, perhaps less conspicuous to the naked eye, are noteworthy for the beauty of their colour, for some are white, others red, yellow, blue, &c. Among the most beautiful of these may be mentioned β Cygni, γ Andromedæ and α Herculis. But we shall not find that all stars are of the same degree of brightness, though this is not necessarily an indication of either their size or their distance. It has been found convenient to divide them into classes or "magnitudes," the brightest being considered of the first magnitude. Few persons can, without optical aid, discern as separate objects stars which are of less than the sixth magnitude, but the order is continued much further for telescopic stars. The determination of magnitudes has till recently been not much more than a matter of estimation; but, as science demands exactness, means have been devised of late years, notably by Professor Pritchard, of Oxford, to secure this end. His mode of procedure is to view the star, the magnitude of which is to be determined, through a wedge of darkened glass which can be moved to and fro until a part is reached, through which the light of the star can no longer penetrate. The position of the wedge is then read on an appropriate scale. This "method of extinctions" has been found very trustworthy.

Again, it will be noticed that many of the stars, which to the naked eye, or even when viewed in the finder, appear to be single, are not so in reality, but double, triple, and even quadruple. In some instances this appearance is due to the fact that one of the stars is nearer to us than its apparent companion, but in almost the same straight line. These, then, are only optically double, but many are really double, being physically connected with each other, though separated by an enormous interval, each circulating round their common centre of gravity. Till about a hundred years ago only four such pairs were known, whereas now a complete list would contain about ten thousand. As the relative positions of those that are not merely optically double is constantly varying, it is of great importance to determine them precisely, and it may be interesting to the reader to know how this is accomplished. The eye-pieces we have hitherto been using are of such a construction that the focus is between the two component lenses, and are called negative eye-pieces. We shall now have to substitute for them another sort—the positive—the plano-convex lenses of which have their convex surfaces facing each other. The peculiarity of this construction is that the focus of the combination is beyond the field-lens; this enables us to observe distinctly not merely the image of a star, but also an arrangement of delicate spider lines placed in the common focus of the object-glass, or mirror, and the eye-piece. As it is necessary for all observers to measure accurately, and in the same manner, the angle which the components of a double star make with each other, there must needs be some fiducial line to start from as the fixed arm of the angle. This is a line joining the true north and south points in the field of view, and indicated therein by a spider-line, technically called a wire, which can be placed in that direction, as shown by a divided "position circle," usually engraved on the eye-end of the telescope. This circle has, of course, its verniers and reading microscopes, together with a mechanical arrangement for imparting a slow rotary motion to the eye-piece and its wire. Having, then, got our new instrument into position, and the larger of the two stars on the wire, all we have to do is to rotate the apparatus from left to right till the wire appears to bisect the other star, when the reading on the circle will show the angle which the line joining the two stars makes with the meridian. In practice a few minutiæ, which are here omitted, must be attended to first, in order to make the observation correct.

But their distance from each other, as well as their relative positions, must be determined. To do this we must avail ourselves of another subsidiary appliance, the parallel-wire micrometer. This consists essentially of an oblong box which, with its positive eye-piece, can be placed in the eye-tube of the telescope. On looking through it we see a fixed horizontal wire and two others in a vertical position, and, therefore, parallel to each other, which can be caused mutually to approach or recede by means of a screw at either end of the box. These screws have large graduated heads, and when the value of one revolution of the screws is determined, we can find the distance of the two stars, the diameter of a planet, &c., by first bringing the wires together, so as apparently to touch one of the stars or one side of the planet's disc, and then by means of its screw causing one of the wires to touch the other star or the other side of the disc in a direction indicated by the fixed wire. The number of turns of the screw will give the angular distance. The double and multiple stars are so numerous that it is very difficult to make a selection, but the amateur will be much gratified by measuring such objects as Polaris, α and ϵ Lyræ, θ Orionis, and ζ Cancri.

Among the mysteries yet unsolved must be placed the variable stars, the light emanating from which does not remain constant. The first whose variability was noticed was α Ceti, which in the course of three hundred and thirty days varies in brightness from that of a star of the second magnitude to invisibility. Some members of this class accomplish their periods in a few days only, while there are others, such as η Argus, which take many years to go through their variations. One of the theories that have been brought forward in explanation of these phenomena, is that these stars are accompanied by obscure bodies which revolve either round them or round their common centre of gravity.

We shall hardly escape being shown the Pleiades, or Praesepe, or the glorious globular cluster in Hercules, or the marvellous Milky Way, which consists of an infinite number of stars, with which our own system is supposed to have some connection.

A question will naturally present itself to the enquiring mind, At what distance are these stars from us?—a question very difficult of exact solution. If a person were to stand not far from the base of the Westminster clock-tower at, say, a quarter-past the hour, and another person were to ascend in a balloon until he was at a level with the face of the clock, the two, though watching the minute hand at the same moment, would not agree as to its exact position. When the quarter is struck, he who is on a level with the clock will notice that the hand has reached the III., but to an observer at the foot of the tower it will appear to be about fourteen minutes past the hour. This apparent difference is due to parallax—"the apparent change of place which bodies undergo by being viewed from different points." Astronomers have endeavoured, and in some few instances successfully, to find the distances of stars from us by noting the exact position in the heavens they appear to occupy at a given time and again six months afterwards, that is to say from another standpoint more than 180,000,000 miles removed from the former one. The resulting annual parallax, as half the difference of the two positions is called, when cleared of all effects produced by other causes, is most minute, and in the case of many stars quite inappreciable. But the number of miles of distance thus represented is bewildering in the extreme, and in their stead the time occupied by light passing over the interval between the star and our earth is adopted. Light, travelling unceasingly at the rate of close upon 190,000 miles in every second, takes more than forty years to reach us from the Pole Star, or, to put the same fact in a different way, if the Pole Star were in some way destroyed to-day, we should not become aware of its destruction till after the expiration of more than forty years. So far as our present knowledge extends the nearest fixed star is α Centauri, which is 275,000 times as far from us as we are from the sun, and the light from which takes no less than four and a third years to reach us.

While moving the telescope about in our explorations among the stars, we shall not fail to come across numerous misty, cloud-like masses, which resemble patches of dim light seen on the dark background of the sky. These are the nebulæ which are scattered, apparently in accordance with no law, over all parts of the heavens, of all conceivable shapes and of inconceivable magnitude. As early as the tenth century a curious object, evidently not a star, had been observed in the constellation Andromeda by a Persian astronomer named Sûfi, but it was unknown to Europeans until discovered in 1612 by Simon Marius. It is, however, so conspicuous as to be easily seen by the naked eye. This nebula has been traced to a length of 4° and a breadth of $2\frac{1}{2}^{\circ}$. Some idea of its apparent size may be formed if we consider that the mean apparent diameter of the sun is only half a degree. The great nebula in Orion has been traced to a still greater distance, as far as $5\frac{1}{2}^{\circ}$ in length and 4° in breadth. There sizes are, however, as far as appearances go, quite exceptional. The dumb-bell nebula in Vulpecula, that in Lyra which resembles a ring, and the spiral nebula in Canes Venatici, not to mention hosts of others, are well worthy of attention. Some astronomers have held the opinion that in the nebulæ we have evidences of the beginnings of worlds, other that they are only enormous aggregations of stars, but at such vast distances as to be irresolvable. It was reserved for the spectroscope to make a more accurate determination of their nature as well as of that of the stars.

By allowing a ray of sunlight to pass through a slit in the shutter of a darkened room, and to fall upon a prism of glass (preferably flint), it will emerge in the form of a coloured band. The simple arrangement thus formed may be improved by using a number of prisms so arranged that when the light emerges from one it enters its neighbour, and so on. This secures a greater amount of dispersion, and causes the band to be of much greater length than it would otherwise be. On examining the coloured band with a small telescope, we shall see that it is striped with a multitude of dark lines at right angles to its length. Although many of these lines were noticed by Wollaston in 1802, and examined and mapped out by Fraunhofer and others, it was not till 1859 that Kirchoff was enabled to interpret their meaning. This may, perhaps, be made clear by the following simple experiment. Instead of making use of the sun for our source of light, let us take a Bunsen burner, in the flame of which a small portion of the metal sodium has been placed. On viewing the band, or spectrum, thus produced, one is at once struck by its utter dissimilarity to that which is formed when sunlight is employed. It is neither covered with coloured bands not streaked with dark lines, but in a certain position—which is always the same relatively to the length of the spectrum—there is one bright yellow line. Now let us take a second burner, also with a piece of sodium in its flame, and arrange the two lights and the slit in such a manner that all are in one and the same straight line. The coloured streak is gone, and a black line appears in its stead, occupying identically the same position. On performing similar experiments with other substances, it will be invariably found that wherever coloured lines are seen in the first instance, when the two flames are used they will be replaced by dark ones. Spectra with dark lines are known as absorption spectra, for the vapour of, say, sodium, has the power of absorbing rays of the same refrangibility as those emitted by itself. A spectroscope attached to a telescope in lieu of an eyepiece enabled Huggins, "the father of spectroscopy," to assert in 1864 that the light of certain nebulæ consisted of glowing vapour. The question of the constitution of—at least many of—the nebulæ has thus been answered. The spectroscope has also been successfully applied to such' few temporary stars as have been observed to burst forth with a sudden intensity of brightness and then wane. On May 12, 1866, a star of the second magnitude was noticed in a part of Corona Borealis, where the observer, Birmingham of Tuam, felt certain that it had not, at any rate in its then brightness, formerly existed. That no star of that magnitude was visible there four hours previously was certified by another observer. The application of the spectroscope revealed the fact that its very sudden increase of brightness was due to incandescent hydrogen. The actual result of such a terrible conflagration will, perhaps, remain for ever unknown to us. T. Coronæ was literally a nine days' wonder, for at the expiration of that time it had become a mere telescopic star.

In many almanacks we find, against certain days, an intimation that meteors may then be expected. Hardly an hour elapses on a clear night without one or more of these small erratic bodies being seen to pass athwart the sky, and sometimes leave a trail of light, occasionally also bursting into many fragments. In fact, many thousands of meteors enter the earth's atmosphere in the course of the year. The Leonids, so called because they appear to emanate from the constellation Leo, have been for very many years noticed on the nights intervening between November 11 and 15. The brilliancy of the shower varies in different years, and reaches a maximum once in thirty-three years; the last display of this nature, when "the heavens seemed to be on fire," occurred in 1866. The radiant points of about a hundred of these meteor showers have been determined with a very considerable amount of accuracy. Schiaparelli found, in 1866, that the path pursued by the August meteors, the Perseids, was identical with that of the orbit of a bright comet which had been seen in 1862. Here, then, was a discovery which seemed to bear on the nature, not of meteors only, but of comets as well. Other astronomers followed the example thus set them, and the identity of the November meteors and Tempel's comet of 1866 was soon established, as well as that of the April Lyraids and a comet which had appeared in 1861. As meteor-showers reappear after a certain time, it is evident that they are parts of our system, and pursue very elongated elliptic paths, as do many comets, unless attracted from their course into hyperbolic or parabolic paths by some more powerful body than our sun.

All comets do not present the same appearance in the telescope, but they have several features in common. Most of them have tails, though they are sometimes inconspicuous in consequence of their distance or size, or their position relatively to the sun and earth; while nearly all have a head, which, when examined in the telescope, usually appears surrounded by envelopes. When a comet first comes into visibility, it generally appears small, and looks somewhat like a misty star—a hairy star, as the name implies. As it gets nearer the sun, a tail is thrown out, increasing in length until the comet is lost to sight from its proximity to the sun, to reappear on the other side of the orb of day, grow fainter, and gradually disappear in the realms of space. The most striking comet of recent years was undoubtedly Donati's, named after the astronomer who discovered it at Florence, June 2, 1858. Not till nearly three months after its discovery did a tail begin to appear, or the comet itself to be visible to the naked eye. It was not finally lost sight of till March 4, 1859. Whatever comets are composed of, their mass is very slight, and their constituent matter of such a nature as to allow even faint stars to be seen through them without loss of brightness. The spectroscope shows that comets do not shine, as was formerly supposed, merely by light reflected by them from the sun, but that they are partly self-luminous, and that their gaseous surroundings contain, at any rate, hydrogen and carbon.

In our somewhat desultory inspection of the heavens, we have viewed some of all the different sorts of celestial bodies, but the two with which we are most intimately concerned have been purposely reserved to the last.

When observing the sun telescopically, it is of the utmost importance that the eye should be protected by some special contrivance from the excessive heat and light concentrated in the focus of even a small mirror or object-glass. The simplest plan is to attach to the end of the eye-piece nearest the eye a "dark head," or glass of some dark colour. The disadvantages attending this method of viewing the sun lie chiefly in the fact that the only means of adjusting the amount of light received is to change the dark head in use for another of a greater or less degree of transparency. The operation, though slight, takes time, and what might otherwise have proved a valuable observation is marred. Sir John Herschel suggested the use of a diagonal eye-piece, which consists of a tube, open at both ends, sliding into the eye-end of the telescope, and having another shorter tube at right angles to itself. In the latter is placed the eye-piece, opposite which, in the longer tube, a piece of plain unsilvered glass is fixed at an angle of 45°, or, better still, a small prism. By these means about $\frac{1}{30}$ of the light, and very little of the heat, is reflected. The diagonal eye-piece is also a great comfort when viewing objects near the zenith with a refractor. A polarising eye-piece is a still greater luxury in solar observations, since it permits the degree of illumination of the image to be adjusted to a nicety. When light falls on a plane glass surface at a certain angle, the reflected rays are polarised, and if then permitted to fall perpendicularly on a plate of tourmaline, capable of being rotated, the quantity of light transmitted can be varied at will. Dawes' solar eye-piece is another contrivance for the same purpose. Briefly, it consists of three circular plates, each of which is capable of independent rotation. In one is a series of circular apertures varying from $\frac{1}{150}$ to $\frac{1}{2}$ inch in diameter; in the next some single lenses; and in the outermost dark glasses of different shades. The lenses have to be focussed by a rack-and-pinion movement. It will be seen that the instrument is rather complicated. A solar and sidereal diaphragm eye-piece of simpler form, devised by the writer some years ago, will be found described in the "Monthly Notices" of the Royal Astronomical Society. In this the variable size of the aperture is produced by a single screw movement. The sun may also be viewed with very great comfort and ease by projecting its image on a piece of card attached to the telescope at right angles to the line of sight.

Having fitted one or other of these contrivances to the telescope, we shall, on viewing the sun, be at once struck by the peculiar mottled appearance of his surface. This is always more or less visible, and is due to intervening spaces of different degrees of brightness. Nasmyth, in 1860, considered that it was caused by a multitude of interlacing masses somwhat resembling willow-leaves in shape; while Huggins and others are in favour of the term granules, or rice-grains, in describing these luminous particles. Bright streaks or faculæ are frequently seen in the neighbourhood of the equatorial region. Much more easy of observation are the dark spots first described by Galileo. These vary very much in size, and not unfrequently attain such enormous dimensions as to be visible to the naked eye. The distance of the earth from the sun is, it will be remembered, about 92,000,000 miles, and the real diameter of the latter rather more than 866,000 miles (though we have good grounds for assuming that it is but a small star), and its apparent diameter differs very little from half a degree. It has been found that spots subtending an angle of not less than 50 seconds of arc (which represents a diameter of 24,000 miles) can be seen without instrumental aid through a mist, or by the mere intervention of a dark glass. Single spots have been known to measure forty or fifty thousand miles in diameter, while many groups have been observed covering areas of more than one hundred thousand square miles. The region of spots is usually confined to a broad space extending 35° on either side of the sun's equator. From observations made by Schwabe during the long period of forty-three years, not a single clear day in which was allowed to pass without a careful scrutiny of the solar surface by his "imperturbable telescope," and the counting of the number of spots visible thereon, he came to the conclusion in 1844 that they were of a periodic character, and attained a maximum once in about every ten years. By a more rigid determination, Wolf, in 1852, found that a period of 11·11 years more nearly satisfied the conditions. What these spots are, what causes them, and what effects their destruction—sometimes almost momentary—we know not with any degree of certainty. We do know that magnetic storms on the earth are in some way connected with them. They present the appearance of dark spots of irregular shape, to which the name umbra has been given, surrounded by a penumbra or lighter border. A nucleus of still more intense darkness has sometimes been detected within the umbra; its blackness is most probably not real, but merely the effect of contrast. From the movement of spots, it has been found that the sun rotates on its axis once in twenty-five and a quarter days.

When, during total eclipses of the sun, the dark body of the moon comes between him and us, and the intense light is thereby cut off, rose-coloured prominences, or red flames, are seen at his edge. Under the most favourable circumstances, the period of totality rarely exceeds a few minutes—too short a time for a minute investigation of these phenomena. It was, therefore, with no small amount of satisfaction that astronomers learnt, in 1868, that Lockyer and Jannsen had independently discovered a method by which prominences could be observed on the uneclipsed sun. The spectroscope revealed the fact that they are glowing masses of hydrogen, reaching to enormous distances, occasionally extending from the sun's surface for nearly a quarter of his diameter, and presenting all sorts of fantastic shapes. Since that time, improvements in instrumental means and in the mode of observing have led to the knowledge that, by widening the slit of the spectroscope, the flames themselves may be seen at any time at the limb of the solar disc. There is no doubt that a very close connection exists between spots, faculæ, and prominences, and one in which it will be found that electricity plays a very prominent part.

If the sun were a thin shell (and, as a matter of fact, we know that not only that body, but all the planets exterior to the orbit of Mars, are not composed of solid materials, as our earth is,) and it were possible to place the earth at his centre, there would be room for the moon, with its diameter of 2165 miles, to revolve round it at its present distance, and leave a marginal radius of not far short of 187,000 miles. As our nearest neighbour, and, in a very great measure, the cause of the tides, our moon and its motions are of great interest. As a telescopic object it is a dead world, subject to no change, and, consequently, we are enabled to study its surface at leisure, more especially as, the period of its rotation on its axis and of its revolution round its primary being performed in similar time, the same face is always presented to us. The observer will immediately notice that the moon's comparative proximity to us necessitates an alteration in the position of the eye-piece, in order to obtain distinct vision. To the naked eye the lunar surface presents a somewhat mottled appearance, due to the unequally reflective quality of its material. The moon, in its varying path in the heavens, is constantly passing between us and some star or other. During these occultations the light of the star is instantaneously snuffed out, as it were, when overtaken by the moon's limb, and its re-appearance is as sudden. This could not be the case if there were a lunar atmosphere of even extreme tenuity; consequently no water can exist there, although the grey plains formerly received, under a false impression, and still retain, the name of seas. When about to observe the moon, especially with a large telescope, it will be advisable to use a light neutral-tint sunshade (Venus, too, is best seen thus in the morning or evening), or a power sufficiently high to reduce the glare. On its surface are plains and valleys, mountain-chains and craters, isolated hills and ridges, rills, faults and clefts. The shadows cast by the mountains and other formations give us a knowledge of their contours, and, by the aid of the micrometer, their actual dimensions can be determined. The crater-mountains are, as Webb observes, "the grand peculiarities of the moon;" many thousands of these have been delineated, all presenting more or less the same features—a terraced ring-wall with a central hill. From sunrise on the moon to sunset, the shadows are perpetually changing, except, of course, when the moon is full and nothing prevents the reflected sunlight reaching us from all parts of the surface. It is for this reason that the moon is not nearly so interesting an object when full as when it presents a crescent or gibbous shape. These crater-mountains are on such a vast scale, relatively to the size of the moon, that the few crater-plains which are known to exist on the earth sink into insignificance in comparison; the diameter of Copernicus, for instance, is fifty-six miles, and it has a peak rising to a height of 13,500 feet. The most noticeable features of the full and nearly full moon arc the systems of bright streaks which emanate from a few of the craters, especially Tycho. These curious rays are not caused by their being elevated above, or depressed below, the surrounding surface; nor has any satisfactory explanation of their presence been hitherto brought forward. One of the most remarkable formations is the Straight Wall, well described by its name, extending for sixty miles, and having a uniform height of 1000 feet. There is so much variety in the lunar surface that the study of even one detail may well occupy a considerable time; if the observer is a good and rapid draughtsman, he will act wisely in making drawings of what he sees. At any rate, he should have a note-book, and make records therein at the time of observation. Never should he trust to the next day's recollections, for doubts will certainly arise. It is only by making, preserving, and afterwards comparing, careful records that we can hope to detect any changes in the heavenly bodies.

Hitherto all our observations have been made with the equatorial and its appliances, but the practical astronomer needs other instruments. It is essential that the time of every observation should be accurately notcd; he must, therefore, have the means of finding the true time, and for this purpose a transit instrument is required. This consists of a telescope very carefully mounted so that it can be moved only in the plane of the circle which passes through the north and south points. The object-glass need not bc large; in the case of portable instruments the aperture is seldom more than two inches, but in large observatories this size is often much exceeded; the Greenwich transit circle, for instance, has a telescope with an object-glass eight inches in diameter. The value of the instrument does not depend on its light-gathering quality, but upon the rigidity of its mounting and the accuracy of its single movement. Attached to one side of the mounting is a graduated circle, and by means of verniers moving with the telescope (or *vice versa*) the inclination of the latter to the horizon is known. Having found from the almanack the altitude of a bright star, it is evident that, if the telescope is adjusted to that angle, the star will be seen in the field of view when crossing the meridian. The interval between two consecutive passages of the same star over the meridian is a sidereal day, whereas the length of the solar day is determined by two consecutive meridian passages of the sun, and differs slightly from the former, the value of which is 23 h. 56 m. 4·091 s. Clocks are made to show sidereal time, and one such is always within view of the observer when stationed at the transit instrument. But the size of the field of view depends on the power of the eye-piece used, and the accurate determination of its centre, that is, of the position of the meridian, is well-nigh impossible. Evidently some contrivance must be adopted, and we again call the services of the spider to our aid. A positive eye-piece being used, at its focus is placed an arrangement of wires (web), generally five in number, one horizontal and passing through the centre of the field of view, bisected at right angles by a second, the others being placed at equal distances on either side of, and parallel to, the central vertical wire. By noting the times at which a star, moving along the horizontal wire, appears to be bisected by each of the vertical ones, its passage over the middle wire, or, in other words, over the meridian, is easily determined. When the first point of Aries is on the meridian a sidereal clock shows 0 h. 0 m. 0 s. Knowing the sidereal time and the right ascension of the star whose transit we wish to observe, it is easy to find the mean time at which that phenomenon will take place, and thereby, if necessary, we can correct our mean time clock. It is usual to select suitable objects from a list of clock-stars, whose places have been determined with a considerable amount of accuracy. As the wires of the eye-piece are invisible on a dark night, provision is made for their proper illumination. The axis of the transit instrument consists of two truncated cones, one of which is hollow in order to permit the light from a suitably placed lamp to impinge on a mirror placed in the main tube at an angle of 45°, by which it is reflected to the wires. A somewhat similar arrangement is generally adapted to the equatorial. Before "taking a transit" one must notice the time by the clock, and then count the ticks of its seconds pendulum, estimating the intervals to the tenth part of a second. This is distinguished as the "eye and ear method," and is being gradually superseded by the use of clectrically controlled chronographs. A barrel, on which may be placed a sheet of paper divided into small squares, is kept revolving by clockwork at a certain rate. Insulated wires conveying a current of electricity are led from the chronograph to the eye-end of the transit instrument or the equatorial, and mechanism is so arranged that when the observer presses a spring and thereby "makes contact," a lever is depressed and a mark made on the paper of the chronograph barrel. The value of the spaces being known, the exact time of the occurrence is thus recorded.

Only a few observatories possess a heliometer. This may be briefly described as an equatorial, the object-glass of which is divided into two equal parts. Each half can be moved in its own plane, and in each will be seen a separate image of the object viewed. The angular distance of two objects not very far apart can in this manner be exactly determined. It need hardly be said that the details of construction in such instruments demand a very considerable amount of care.

One branch of the science remains to be mentioned —Celestial Photography, and with a brief account of it our imaginary visits to the Observatory must terminate.

The first successful attempt to make a celestial object record its own image on a sensitive plate was made by J. W. Draper in 1840. Using a telescope of five inches aperture he obtained some pictures of the moon, one inch in diameter. Ten years later, pictures of double that size were obtained with the fifteen-inch refractor of the Harvard College Observatory, with which instrument Whipple was the first, in July 1850, to obtain a photographic image of a star, the one selected being α Lyræ. Others soon entered a field which promised such a rich harvest, and two years afterwards de la Rue demonstrated the possibility of using the camera attached to a reflector with equal success. In 1857, twelve years after the first solar daguerreotype—a poor one, it is true—had been taken, de la Rue was commissioned by the Royal Society to superintend the construction of an instrument specially adapted for the purpose of photographing the sun. The photoheliograph, which was the result of his labours, has served as the model on the lines of which all instruments of that class have since been made. The first eclipse of the sun to be photographed was that which took place in 1860, and a satisfactory solution was thereby obtained to the question, which had long exercised astronomers, whether the red prominences really belonged to the sun or not. Great strides have been made in the photographic art and new processes have been discovered, enabling operators to secure pictures with greater rapidity and better results than formerly. Rapidity is a very important point, for although ordinarily good clockwork will impart a fairly equable movement to a telescope, it is frequently found to be not sufficiently accurate to enable one to keep the image of a faint star or nebula on exactly the same point of the plate for any considerable length of time. Not merely have sun, moon, planets, stars and nebulæ been photographed, but also their spectra, and thus permanent pictures have been obtained, which can be measured and whose meaning can be interpreted at leisure. Another advantage of photography is that the actinic rays impress on the plate images of stars and nebulæ quite invisible to the naked eye. The most splendid specimens of stellar photographs yet seen were obtained by Messrs. Henry, of Paris. One of their plates discloses the existence of nearly five thousand stars in a small patch of sky in the constellation Cygnus, where only 170 had previously been catalogued. Results so successful as this and many similar ones have led astronomers to the belief that the laborious process of observing and cataloguing objects by the older method involves very serious loss of time, and the principal observatories in the world are now combining in the magnificent project of forming a photographic celestial atlas on a uniform scale. According to the plan adopted we may hope that this gigantic design will be accomplished in the course of about ten years. When this is completed, as it will undoubtedly be, our knowledge of celestial space will be enormously extended, and it is not too much to expect that great discoveries, hitherto undreamt of, will be made. It will be for another generation to form a second edition of this celestial atlas, when, by comparing the two, changes of position among the double and multiple stars, as well as the nebulæ, will at once betray themselves.

BIRDS AND FIELD-MICE.

THE remarks which SCIENCE-GOSSIP contained in a recent number regarding the mischief caused by the destruction of small birds, may well apply to the indiscrimate killing of the larger ones. I may perhaps mention a circumstance which came under my notice some time ago. I had occasion to make a sojourn of a few weeks at Wildbach, near Frankfort. A large garden containing apple-trees, vines, potatoes, etc., lay close to the house. The ground of this garden was entirely riddled by field-mice, and it was becoming a serious question whether it would ever be productive owing to the swarming of these animals. The surrounding fields also were the haunts of thousands which wrought very considerable damage to the crops. The sight of the garden just referred to was at once pitiable and laughable; pitiable because of the ragged and forlorn appearance caused by the raids of the mice on its products, and laughable, because at very short intervals, two shining black eyes and a sharp nose were to be seen protruding from holes in the earth, evidently belonging to denizens who were ready to show that discretion was the better part of valour, or to make a bold dash for a plum or an apple as soon as the coast was clear. When out, a footstep was enough to make them rush back into their holes. They were tolerably canny, however, for I perceived by looking one day over my shoulder that as soon as I had passed on they peeped out again, and scampered off with amazing celerity. One very large mouse indeed, fat and audacious, seemed to be a sort of Nabob among them, a tyrant, and evidently capable of vigorously asserting himself. I happened to be sitting quite still on a seat in this semi-wilderness, when an apple fell from a tree. Instantly several field-mice rushed from their holes, well knowing evidently what the thud meant and made for the apple, when lo! the Nabob sallied out of his hole. Off pelted the crowd to their retreats, where they waited until this bloated aristocrat had had his fill. He ate, until he evidently could eat no more, and then left the rest of the apple as unworthy of any further attention—retiring to his hole, doubtless there to rest his well-gorged stomach. When he had duly retired, the humbler members of the colony darted from their holes, at the entrance of which they had been watching the proceedings of "might against right," and scrambled and pushed up against one another to get a nibble of the remains of the fruit.

But this brings me to the main point. This swarming of the field-mice arose from the destruction of the owls. Numbers of these birds used to haunt the neighbourhood, and of course kept down the mice. But from some reason or the other (I fancy there was a superstitious feeling about the poor bird), there had been a raid upon them, and the destruction was so great that the neighbourhood had been entirely ridded of them, and to the great damage of the country around. So inveterate had been the feeling against the owls, that the people had not only killed the birds, but had carefully sought out and destroyed their nests. It is some time now since I was at Wildbach, but it was said then, that it would be years before owls would again frequent the place. Doubtless by this time the inhabitants are wiser, though certainly sadder men.

D.

THE COLOURING AND BANDING IN LAND AND FRESH-WATER SHELLS.

MR. PACE'S criticism (p. 233, *ante*) on my article published in the August issue is amusing. I cannot help thinking that he could have written it otherwise than as a jest. For what he states he gives no references; and in one or two places it seems his bent to put different constructions on words than what they were obviously meant to convey. "As well as"—these were my words—are plain enough for the conception of the simplest reader. The words "polar opposite" were obviously not meant in any mathematical conception, and to me they are more expressive than the words "diametrically opposite." But the very words which I have used have appeared in some recent biological monographs with the same construction as I placed upon them. To his tabulated statements my reply shall be brief, but to the point, and I shall take them seriatim.

(1 and 2.) Mr. Pace does not seem to know the difference between the *primary* and the *secondary* shell. I shall not here differentiate between them more than I have previously done. I will not deny that the organic matter of the *secondary* shell is composed of conchyolin—in fact, I have laid considerable stress on this fact in my little volume on "Land and Fresh-water Shells." But it is distinct news that the plug in the shell-gland is composed of this substance. Has Mr. Pace analysed these plugs, minute as they are, and can he give us the differential chemical analyses of conchyolin and chitin? If so, I wish he would give your readers the advantage of such an advanced and intricate study. But I doubt all such. And my reason for doubting is that the late Francis Balfour, in the first volume of his "Comparative Embryology," says distinctly on p. 229 that the plug is a chitinous one. If Mr. Pace will refer to this page he will find the following words: "The shell-gland arises as an epiblastic thickening on the posterior and dorsal side. In this thickening a deep invagination is soon formed, in which a chitinous plug may become developed (Paludina, Cymbulia? etc.), and in abnormal larvæ such a chitinous plug is generally formed." However, whether it is composed of chitin (which is more probable), or its ally conchyolin (which is less probable) does not invalidate my theory. All that concerns the theory is that the plug is horn-coloured.

(3.) Necessarily I mean here all the fresh-water species with which I am acquainted. Mr. Pace could not have read my article very circumspectly, or else he would have known that in it I specially referred to British forms. He places against my statement several foreign, and, in some sense, isolated genera; but I imagine that with the foreign species other factors come into play, such as the one of low latitude given by Tryon, I believe on the authority of Dr. Morch, in his "Structural and Systematic Conchology." They, however, do not invalidate my theory that they might have descended from horn-coloured ancestors. The only two genera to which he refers, and which have British representatives are Paludina and Neritina. Of the first-named genus we have two species, each of which has an unicoloured and unbanded variety. *Neritina fluviatilis*—the only species of the second-named genus in the British fauna—has two unicoloured and unbanded varieties. This at any rate is suggestive. An inspection of the fresh-water specimens in the British Museum will convince any one that horn-coloured forms are the most frequent. Mr. Pace further wants to know how it is that environmental conditions can be less in water than on land. May I ask him how they can be equal or greater? Unfortunately he gives no proofs of his statement, and what I said is, I believe, acknowledged as a working fact by our best evolutionists.

(4.) This is rather hypercritical. Mr. Pace demurs to the use of the word "flammules," but whether he thinks this has anything to do with the validity of my theory I do not quite make out. "Flame-like," which he proposes, has on his terms the same objections as "flammules." The word is adopted from Moquin-Tandon, and, moreover, is a most legitimate term. If Mr. Pace will read the various articles in the "Journal of Conchology," and other scientific journals, he will find the word to be in common usage.

(5.) I do not know so much about this (I refer to Mr. Pace's statement). My specimens of the species to which he refers do not show much, if any, deviation from the nucleus-colours I have stated. Two years ago, owning to the kindness of Mr. Smith, I looked over several hundreds of specimens (foreign and English) in the British Museum, and could hardly find one exception to the fact as given by me. Mr. Pace does not give us the colours of the nuclei of the species he enumerates, and which he has apparently in his collection. I wish Mr. Pace had in this, and in others, stated his differences more thoroughly.

(6.) The highly- and variably-coloured Helices would not be expected to as readily revert to the horn-coloured as to the white variety.

(7.) I know this simply as a matter of study. I am not aware that it has ever been conceded that any animal, as far as immediate progenitors are concerned, has changed its marine habitat for a strictly terrestial one. I do know, however, that it is considered that some animals primarily of terrestial habit at have taken to one which is purelymarine. And, moreover, I know that it is thought by some (Sollas and Milnes Marshall among others) that freshwater faunas have had their origin from marine aunas. Mr. Pace gives no reason as to why *Cyclostoma elegans* has descended from marine ancestors. The fact that species of Cyclostoma, accompanied with distinctly freshwater species, have been found in the lower series of the Bembridge limestone, and in various Pleistocene deposits of fresh-water origin negatives such a view. But the best evidence is that this species has a gill in its early stages which aborts as the embryo grows older (compare Hatchett Jackson in Rolleston's "Forms of Animal Life," 1889 edition, pp. 479 and 482). Again there is the fact that many freshwater species, as the *Succineæ*, are amphibious, and that the change from an aquatic to a purely terrestial life is indicated in the interesting arrangement of mantle-cavity in the amphibious Ampullaria as recorded by Jourdain and Sabatier (Jourdain, C.R. 88, 1879, Sabatier, ibid., and A.N.H. (5) iv., 1879).

(9.) May I ask Mr. Pace one question? Are points more complex than bands? It seems to me that he does not quite get the gist of Von Baer's law. Are not bands and lines practically a confusion and coalescence of many points? If points arise as a resolution of bands then it seems to me it is a retrogression from the complex to the simple, and point blank to one of the most general laws of nature. I do not think many readers will concede to Mr. Pace this point of evidence against my theory.

(10.) Mr. Pace says that what I have stated under this heading illustrates my "misconception as to what 'environmental conditions' really are." I have already replied to this under heading (3). The word "environment" I have always taken to mean "surroundings." I do not know whether Mr. Pace has an entirely different and private construction, or meaning, to place on this common and oft-used word of the English language.

(11.) In some sense I do. Any field-naturalist will support me when I say that the hyalinæ are scarcely ever found destroyed by birds as are their more conspicuous brethren, viz., *H. aspersa*, *H. nemoralis*, *H. hortensis*, and *H. arbustorum*.

In conclusion, I hope I may not be considered hypercritical when I say that if Mr. Pace has—and he seems to have—a prejudice against, or doubts about the validity of the laws of Haeckel and Von Baer (believed in by all our best workers), on which my theory wholly rests, I cannot help it, and, therefore, my article was not written for him. I sent my article to Dr. Wallace and Dr. Romanes: the former writes me that he thinks my "view of the primitive colour is probably correct," and the latter also writes that to him "the theory it sets forth appears very probable." I am therefore prepared to adhere to it as a working hypothesis.

J. W. Williams.

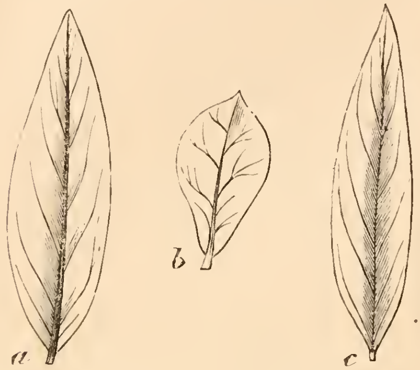
NOTES ON SENNA.

THIS well-known and important drug is the produce of several species of the genus Cassia. Senna leaves, as they are termed in trade, are the leaflets of three or more different species, the leaves themselves being of a pinnate form.

They are of various shapes, and derived from various sources. The East Indian or Tinnevelly senna, which, by the way, is considered the finest kind, is obtained from *C. elongata*, Lemaire. Characters—leaflets lanceolate, rather downy beneath, with close-pressed hairs. Largely cultivated in India, and imported in large quantities from Tinnevelly. The Tinnevelly senna, however, of retail shops, is generally a mixture of three species, hence not so good as represented.

The Alexandrian senna is the produce of two species—*C. acutifolia*, Delile—characters: leaflets ovate, with long spreading hairs near the under-side of the mid-rib, and *C. obovata*, Colladon—character: leaflets obovate, obtuse, slightly mucronate. These two species are cultivated in Egypt and Nubia, and imported in large quantities from Alexandria.

These are the principal species recognised. There is another kind less esteemed imported from Aleppo, consisting of the leaflets of *C. obovata*, but this kind is subject to great adulteration, and is not recognised by the "British Pharmacopœia," although it is largely used, as well as the leaflets of *C. acutifolia*, for the adulteration of the finest kind. The leaves of other plants are often used for the adulteration of senna,



Figs. 149.—Senna Leaves. *a, Cassia elongata; b, C. obovata; c, C. acutifolia.*

but true cassia leaves may be easily recognised by being unequally-sided.

The nauseous taste and smell of senna is due to the presence of a volatile oil, stored up in reservoirs in the leaf-tissues, while the purgative effects are produced by a chemical substance known as "cathartin," according to some authorities.

All the species mentioned here are grown at the different botanic gardens in this country. *C. acutifolia* and *C. obovata* are figured in "Nees Plant. Med.," Pl. 345, 348. *C. elongata* is figured in Royle's "Bot. Himal," Pl. 37.

Although, as mentioned above, it has been stated that the purgative properties are due to the presence of "cathartin," it is well to remember that others have disputed that statement, notably Mr. Heberlein, whose experiments seem quite sufficient to prove that the active purgative properties do not exist in the cathartine contained in the leaves.

J. T. Riches.

THE EVOLUTION OF POISONS IN PLANTS.

It is generally admitted that the development of poisonous constituents in plants is in its object defensive. The more wholesome any plant, the greater, on the principle of natural selection, should be its chance of escaping destruction by animals, and consequently of survival and extension. But in numbers of cases poison seems to afford no protection. Every one is aware of the noxious character of the common foxglove; but to certain animal species, and especially to those most important to be repelled, the poison is harmless, if not attractive. A slug or a snail will feed in a plot of seedling foxgloves just as will a donkey in a carrot field, or a cow in clover, not for want of more suitable food, but preferentially, passing over harmless plants. So that the poison of the foxglove as a protective agent is a complete failure.

The laburnum tree when young is very liable to the attacks of the same depredators, which may often be picked off its lower shoots, and its bark does not escape the unpleasant attentions of rodent mammals. The bark of the mezereum is rich in an irritant poison, but hares and rabbits gnaw it greedily in the winter season, and often completely spoil the trees.

The periwinkle, as it is absurdly called, in consequence of successive corruptions, is greedily consumed by snails and slugs in spite of its dangerous properties.

As to insects, they seem to frequent and feed upon poisonous plants quite as eagerly and commonly as upon wholesome species. As a few instances, we may take the oleander hawk, which preys on the leaves of the oleander and the periwinkle, both poisonous; the "death's head" (*Acherontia atropos*), which feasts with impunity on the deadly night-shade (*Atropa belladonna*); the spurge-hawk (*Deilophila euphorbia*), as well as *Chelonia hebe*, and *Calocasspa exodata*, have for their regular diet various species of the spurge plant. No plant is, I think, more zealously devoured, both by insects and snails, &c., than the common night-shade and bitter-sweet.

We see, therefore, that poisons fail to protect plants against some of their worst, we might say their very worst enemies, i.e., snails, slugs, and the bark-eating rodents. If, then, their production demands a certain expenditure of vital energy, we may venture to say that poisonous plants are in a worse position than their harmless neighbours, and we have still to ask—wherefore, then, the poison?

J. W. Slater.

THE SMALL-END COLOURING OF EGGS.

With reference to Mr. Wheldon's note on this subject in February, and to Mr. Nunn's in Science-Gossip for October, I should like to state the result of my experience, which goes to show that examples of small-end coloured eggs amongst sea birds is very rare indeed; in fact, I may add that out of some three hundred very choice varieties of eggs of the guillemot in my collection, selected from several thousands, I can only find one so marked, and don't remember having ever seen another. The variety in question is of a pale uniform white colour, with a rich deep brown circle at the lower end.

Out of some eighty fine varieties of the eggs of the razorbill, I fail to find one single example thus marked, and do not remember having seen one. This latter remark applies to the eggs of all the other sea birds with which I am acquainted, except that of the kittiwake, of which, out of about forty varieties, I possess one thickly blotched at the lower end.

I have some eighty varieties of eggs of the black-headed gull, selected from four or five hundred, and not one of these is coloured only at the lower end. I do not, however, consider end-coloured varieties only at all rare amongst other species, as I have numerous examples so marked in my collection.

The eggs of the Falconidæ and Corvidæ are, of course, amongst the most numerous examples: then come those of the warblers and finches, and I believe it occurs, more or less, in all the families. I might add that a partridge egg in my collection has the small end of a blue colour.

My experience amongst sea birds is gained from three or four visits annually for the last ten years to the long range of cliffs extending from Flamborough to Filey, the home or nursery during the breeding season of countless numbers of guillemots, razorbills, kittiwakes and puffins, which are to be seen here, I believe, in greater numbers than at any of their other breeding stations, and during that time I have looked upon and selected varieties for my own collection from many thousands of their eggs, as well as seen a great number of specimens in private collections and museums.

Of course, the information I have adduced is principally valuable in so far as it concerns sea birds' eggs from Yorkshire; and I do not wish it to be understood that because my experience proves small-end coloured eggs amongst sea birds rare, that such is generally the case, as it is well known that certain districts are famous for their special forms of variation; for instance, the dark reddish form from Speeton, Bempton, and Buckton, and knowing Mr. Wheldon personally, I am inclined to think he can throw more light on the matter in support of his statement.

I trust we shall have the experience of other naturalists from widely different districts, who are acquainted with the eggs of sea birds, especially those of the guillemot and razorbill, as to whether they have found this form occurring, and, if so, in what numbers. Collectors, too, might oblige us with a description of any end-coloured eggs of these birds which they may possess.

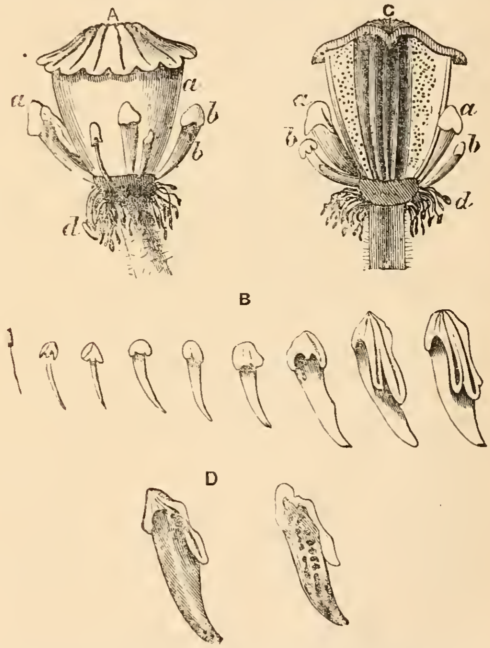
In conclusion, allow me to state that I have followed with great interest the letters which have recently appeared in your valuable columns respecting varieties in the eggs of our British birds, and shall have great pleasure, when time permits, in forwarding a list of some of the more remarkable forms in my collection.

WILLIAM HEWETT.

York.

ABNORMAL DEVELOPMENT IN THE ESSENTIAL ORGANS.

THIS is, perhaps, a very rare freak in the vegetable kingdom, but has, to my knowledge, occurred once before in the same species, which was mentioned by Bentley in the "Pharmaceutical Journal" for March, 1856. It was in June, 1889, that I found this monstrosity at Acton, which represents all the grades from the Andrœcium to the Gynœcium. The usual number of dissepiments in the syncarpous ovary of *Papaver bracteatum* is twelve, with the lobes and canals of the stigma to correspond; but this had eighteen, thus gaining six extra to the true ovary. These were situated between the ovary and stamens, and consisted of three whorls, of which the first was coherent with the ovary (Fig. A, *aa*, and Fig. B, 6, 7, 8). The second whorl was inter-



Figs. 150.—A, Essential Organs of Reproduction of *Papaver bracteatum*; C, longitudinal section of same.

mediate between a half stamen and an ovary, which were placed between the former and latter whorl, and were quite free (Fig. C, *bb*, Fig. A, *b*, and Fig. B, 3, 4, 5). The third whorl was next to the andrœcium (Figs. A and C, *dddd*), and Fig. B, 1, 2, 3), those mostly like stamens having anthers which contained pollen, although having a resemblance to the gynœcium. All these three whorls were hypogynous, the same as the andrœcium, which were placed after this latter whorl, and consisted of five or six whorls. From these three whorls a perfect graduation could be formed from a carpel to a stamen (Fig. B). The following is a short description of each gradual development. Fig. B, 1, represents a first difference from a stamen. This had one side a unilocular anther, and the other side the portion of a barren stigma; that is to say, one which has no viscid fluid to retain the pollen at the time of fertilisation. If it had this fluid at that period, it would be bi-sexual. The filament supporting this was the same colour as the purple anther lobe; the barren stigma was of a shining raw sienna colour. Fig. B, 2, represents the same a little more developed, having a greater portion of the barren stigma, at the former end of the filament was a little enlarged, and of a bright green colour, resembling that of the ovary; this was about one-quarter of its whole length; the other part was purple (Fig. B, 3), and had one-quarter anther, and three-quarters barren stigma, whose enlarged filament had one-half green, of which the latter end was purple. Fig. B, 4, had the filament capitulated with a barren stigma, which was of a shining raw sienna colour; the filament was thick and hollow, and at the latter end had a tint of purple. Fig. B, 5, had a thick hollow green filament about one-eighth of an inch in diameter; this supported a perfect but barren stigma. Fig. B, 6, had the same filament, but thicker at its upper end, having a larger stigma with a portion of one of the canals on one. This canal contained the viscid fluid for the preservation of the pollen. There was a small barren syncarpous ovary; this and the preceding were coherent to the gynœcium (Fig. B, 7), which represents a syncarpous ovary, with two dissepiments. The stigma had two long perfect canals, and on the opposite side were four lesser abortive ones. The placentas had the neuclei (Fig. B, 8), and there was a small syncarpous ovary with parietal placentation, of which two had perfect dissepiments, and four small abortive ones. This had been fertilised with the gynœcium, and within it contained matured seeds. Fig. D, is a longitudinal section of the last mentioned, and would have been a perfect syncarpous ovary had it not been for the abortion of one side; and would have had six dissepiments, with a six-lobed stigma, with six canals, so that there would be a small syncarpous ovary, with six dissepiments less than ordinary gynœcium of this specie.

HENRY ERNEST GRISET.

Faygate, Sussex.

NOTES ON *STELLARIA AQUATICA*, SCOP.

DURING the past summer some extremely viscid specimens of *Stellaria* (*Malachium*) *aquatica*, Scop., have been growing on a small bed of river gravel, thrown up by a serious flood in the River Teme near here some years ago. These plants grow close to the water's edge, and are without any protection from the sun's rays, which strike with much force upon this small island. The stems are diffuse, decumbent, and very weak, their lower portions being glabrous, while their upper portions are remarkably viscid; and this not only at the nodes, but their internodes and very short petioles are also very sticky, as well as the peduncles and calices. The stems, where growing among other plants, trail over them for some distance, and lengthen considerably; but others, obtaining no such support, lie close along the ground, only becoming erect where they commence to flower. It may be noted here that those plants which grow in the open are very much smaller, and are more than three times as viscid as those growing among other vegetation.

This stickiness has puzzled me much, and on looking into the few authorities I have, I find but little notice has been taken of it, or of the reasons for viscidity generally, except as assisting cross-fertilisation by preventing the access of small creeping insects to flowers. Dr. Kerner (in "Flowers and their Unbidden Guests," p. 52) says: "More remarkable than all those caryophyllaceous plants in which the peduncles are transformed into actual lime-twigs." Dr. J. E. Taylor also says: "The most widely adopted protective contrivance employed by plants to protect their flowers is the secretion of some sticky substance on the stems and calices of flowers, which act as a kind of 'lime,' in which the greedy ants are sure to be caught and killed. The order Caryophyllaceæ has been the most successful in employing this device. . . . The reason for the secretion of these sticky fluids by plants is a defensive one" ("Sagacity and Morality of Plants," pp. 141, 142). Again: "Plant hairs in not a few instances have been converted into glands, and now secrete the viscous fluid which anoints the stems of flowers, rendering them sticky and incapable of being climbed" (Taylor's "Flowers: their Origin, Shapes, &c.," p. 316).

These quotations (and others could be made) all tend to one point—that the stems of viscid plants (of which *Stellaria aquatica* is one) are glandular in order to keep the flowers from being rifled of their pollen and honey by creeping insects; but is there not another reason in this case? The stems of *Stellaria aquatica* are diffuse, decumbent, and very weak, with the lower portion perfectly glabrous and the remainder (two-thirds or more of their length) extremely viscid. The explanation I venture to offer is, that this viscid secretion, besides acting as a protection to the honey against the attacks of creeping insects, is also a protection to the plant itself against the extreme heat of the sun's rays upon its bare and stony habitat.

The objection which at once occurs is, naturally, that it would be just as necessary for the lower part of the stem as for the upper to be sticky. The decumbent lower parts of the stems have, however, only the heat from above to contend against, and their diffuse stems covered by the lower leaves afford a sufficient protection against this, while the weak, brittle upper portions, becoming partially erect, have to be protected against the heat from above, and the effects of the radiation from the hot stones below. As authorities that plants are protected to some extent against heat, I venture to quote Sir J. D. Hooker's invaluable "Science Primer on Botany," p. 103: "Hairs . . . . are protections against wet, cold, and the effects of drought on the subjacent tissue." In "Flowers and their Unbidden Guests," again (p. 49, note): "The viscid substances with which parts of plants are coated are not always intended to act as a protection to the flowers from unprofitable visits. The viscid coating of many young leaves, especially in plants whose flowers are nectarless, and whose pollen is dusty (populus, alnus, betula, juglans), protects these leaves while still young from evaporation and desiccation, acting as a layer of varnish." Sir John Lubbock, in his work on "Flowers, Fruits, and Leaves," pp. 135, 136, says: "Mr. Taylor has pointed to the power which, as Tyndall has shown, the spray of perfume possesses to bar out the passage of heat rays, and has suggested that the emission of essential oils from the leaves of many plants which live in hot climates may serve to protect themselves against the intensely dry heat of the desert sun."

May not, then, this sticky secretion on *Stellaria aquatica* be in like manner a protection against evaporation? The stems are very weak and very brittle, and when the sun is shining a very large amount of moisture must be drawn from the leaves; and it would seem almost impossible for the stems (small as they are) to convey a sufficient quantity to the leaves to prevent them from being dried up if they had not some protection against too rapid evaporation. Those leaves, too, which are situated below the limits of the glandular hairs are the first to turn brown and die off, while the plants are still flowering profusely and the other leaves are perfectly green and fresh. If protection against insects alone were necessary, this is provided for by the very glandular peduncles and calices, and there would have been but little necessity to carry the viscidity for any distance down the stem.

Among the other plants growing on the same small island, *Linaria minor*, Desf., *Tanacetum vulgaris*, Linn., and *Verbascum virgatum*, With., are very glandular-hairy; *Mentha saliva*, Linn., is hairy; *Galeopsis Tetrahit*, Linn., is hispid; *Scutellaria galericulata*, Linn., is puberulous, and *Atriplex hastata*, Linn., is mealy. Most of these are still (October) flourishing, but several species of rumex and polygonum are now quite burnt up.

I hope in time to make some further observations upon this species; and, in calling attention to it, I need hardly say that I shall be most pleased to receive the opinions of more able and experienced observers upon this subject.

In conclusion, I would add that the viscid stems of this plant are undoubtedly a protection to the flowers against creeping insects, which, after crawling up the stems for a short distance, have their legs caught beyond hope of recovery among the sticky hairs. How frequent this is may be understood by the fact that it is almost impossible to pick a stem without finding the dead bodies of several insects attached to it, and looking like little black spots here and there. Nature in this case attains two ends (and probably more) by the same means.

ARTHUR W. WEYMAN.

Ludlow, Salop.

SCIENCE-GOSSIP.

WE beg to call attention to a paper on almost a new subject both for naturalists and collectors, viz., that by T. D. A. Cockerell, in the "Annals and Mag. of Nat. History" for October (reprinted), on "Slugs, chiefly in the Collection at the British Museum."

MISS E. A. ORMEROD's second edition of a "Manual of Injurious Insects," with method of prevention and remedy for their attacks to food-crops, forest trees, and fruit, is announced, and may be had of W. Wesley, 28 Essex Street, Strand.

WE have received a reprint of Professor E. D. Cope's remarkably interesting paper on "The Horned Dinosauria of the Laramie" (illustrated).

MESSRS. W. Wesley and Son's "Natural History and Scientific Book Circular" is to hand, No. 103. It is one of the most interesting of all the book catalogues we receive, and we confess a weakness for them.

EVEN more interesting and instructive (for there are crisp and pithy little notes added) to lovers of old books of all sorts and conditions, is Pickering and Chatto's "Book-Lover's Leaflet," published monthly.

"THE MONIST," a new American monthly, contains some capital papers by Romanes, Binet, Cope, Carus, and other scientists. It is, in fact, an international physiological and psychological magazine.

WE have received No. 1, vol. iii., of "Insect Life," edited by Dr. Riley and others. It is devoted to the economy and life-habits of insects, especially in their relation to agriculture in America.

THE second annual meeting of the Bedford Amateur Natural History Society was held on Thursday, October 30th. At the meeting all the officers were re-elected, and Mr. J. Hamson was elected vice-president. Votes of thanks were passed to Dr. Crick for his kind services throughout the year. The report states that forty-four meetings have been held during the year, and there have been several pleasant excursions.

THE Geological Photograph Committee of the British Association have issued a third circular to arrange for the collection, preservation, and systematic registration of photographs of geological interest in the United Kingdom.

MR. R. L. WALLACE'S works ("British Cage Birds" and "The Canary Book"), have reached the seventh number, published by L. Upcott Gill, 170 Strand. The illustrations are excellent.

THERE is a capital and appreciative review of Dr. Von Lendelfeld's splendid "Monograph of the Horny Sponges," a huge volume recently published by the Royal Society, in the November issue of the "Annals and Magazine of Natural History."

MESSRS. W. WESLEY AND SON (28 Essex Street, Strand), have just issued No. 104 of their most useful Natural History and Scientific Book Circular, relating to works and pamphlets on Botany, Conchology, Entomology, Mammalia, Ornithology, Ichthyology, Physical Science, &c.

MR. LAWRENCE HAMILTON M.R.C.S. of Brighton, has issued a leaflet on "Fish and Leprosy" which we strongly commend to all thinking as well as reading men.

THE "Geological Magazine" for November contains a description (illustrated) of two new species of Miocene echinoderms discovered by Dr. J. E. Taylor during his recent visit to Australia. They were found in the limestone cliffs of the Murray river, at Morgan, South Australia.

WE beg to draw the attention of our readers to the "List of Animal Parasites" issued by Mr. C. J. Watkins, King's Mill House, Painswick, Gloucestershire. It will be especially interesting to students of the Anoplura.

MICROSCOPY.

HINTON'S NEW SLIDES.—We have just received two beautifully mounted specimens from Mr. Ernest Hinton, 12 Vorley Road, Upper Holloway, one being the phantom shrimp (*Caprella linearis*) of S. Australia, and the other one of the Tubularian zoophytes so common on the same coast. The latter has its tentacles fully expanded. Both objects are unusually beautiful with the paraboloid or polariscope, and the zoophyte, with its gonophores, is a very instructive object indeed.

THE ROYAL MICROSCOPICAL SOCIETY.—The last number of the well-read and splendidly edited "Journal," besides the capital summary of "Current Researches relating to Zoology and Botany," &c., contains well-worked out bits of genuine good work in the papers by Messrs. H. W. Burrows, C. D. Sherborn, and the Rev. George Bailey, on "The Foraminifera of the Red Chalk of Yorkshire, Norfolk, and Lincolnshire" (accompanied by four crowded, excellently illustrated plates of figures); and an important though brief note by Dr. H. B. Brady, F.R.S., "On a New Type of Foraminifera of the Family Chilostomellid."

ZOOLOGY.

COLOURS OF ANIMALS.—Mr. Tansley's dissertations in recent numbers of your journal on the insect-selection theory, etc., possess the merits of clearness and definiteness. Without wishing to take part in the discussion, I should like to offer a few remarks which may be taken for what they are worth. Everybody, I suppose, who reads the popular journals or listens to the lime-light lecturer, has by this time raised some idea as to the nature and purport of the theory aforesaid. It is clearly an outcome of Darwinism as distinguished from Lamarkism. Cross-fertilisation in plants is a benefit whereby the congenital variations thereof, as distinguished from the acquired characters or functionally produced modifications of structure, can be "selected" and transmitted. Insects are the chief agents in the operation of cross-fertilisation, and the bright colours of flowers are the chief agents in the attracting insects to discharge this function. The colours, therefore, have a distinct "physiological value," or "physiological significance;" and only granting for a moment what is extremely questionable, viz., that they actually do attract insects, they evidently seem very fitting subjects for the operation of that utilitarian principle of preservation called "natural selection." That operation in this case may be exhibited as follows:—"Among the numerous spontaneous variations which are ever occurring among flowers, bees are supposed to select for their visits those best suited to them and to neglect the others. The former receive the advantages of cross-fertilisation, and consequently vanquish the others. By a process of living down those which have not varied, or varied in the wrong direction, the favoured variety attains the rank of a distinct species. It is assumed of course that the largest, most get-at-able, and most brilliant flowers are those best suited to the visits of bees, etc., and of these flowers the blue and red are preferred to the yellow, white, or greenish. Now, bees frequent flowers in order to gather honey and pollen, and the further assumption inevitably follows, that the blue and red flowers are more highly charged with these substances than the others are. Is that so? What says the physiological chemist? Again, blue is preferred to red, and the like double question may be asked. To put the matter in the most broadly generalised form, is it a scientific fact that the blue colouring matter of flowers is evolved from or necessarily dependent on the saccharine (honey) and the nitrogenous (pollen) constituents of any portion of the inflorescence or stalk? Further, if the "function" of the bright colours is to attract insects, then in what way is an analogous function exhibited or discharged in the case of dull-coloured or whitish flowers? By their perfumes, their volatile essences, and saccharine effluvia. As a matter of course the elastic theory embraces all these, for it holds that the odoriferous principles have also been "selected" or evolved through the agency of insect fertilisation. By being perpetually rifled through many generations it is possible indeed that the flower may be stimulated to produce an extraordinary quantity of honey and pollen; but is it also likewise, and at the same time urged or necessitated from the same or other cause to generate an extraordinary quantity of volatile or ethereal essences or quintessences? The pale flowers of the lime tree contain 0·1 per cent. of a very volatile and odoriferous oil, they are eminently charged with saccharine matter, and are perpetually haunted by hosts of insects. Is it the oil or the sugar that attracts the insects, and is the presence of one of these plant constituents dependent on that of the other, or in any way chemically connected therewith? I am disposed to think that in every instance it is through his nose, not through his eyes that the insect is attracted; and perhaps some learned entomological correspondent will obligingly impart to your readers some information about the olfactory organs of bees, etc.—*P. Q. Keegan.*

BOTANY.

Euphorbia Cyparissias in Kent.—Readers of Science-Gossip may, perhaps, be interested to hear that I gathered this rare plant in what appears to me a rather strange locality in Kent, viz., on the open slope of a grassy down not far from Dover—a down that runs parallel for some little distance to the road leading from Dover to Folkestone. I say "a rather strange locality," because no botanical works I have consulted quote the plant as to be met with in any spot but woods. Sowerby gives "woods," and quotes its having been found in such localities in several counties, but goes on to say that, even in the spots mentioned, it does not, in all cases, appear as growing really wild. Kent is not mentioned in the counties he names; and I should be glad to learn if any readers have ever met with it there themselves, or heard of its having been found anywhere in the county; also, if they have ever found it growing as unmistakably wild, and in such thoroughly open country as that in which I gathered it myself in June? I was botanising on the hills round there, and was just about to pass down from the hillside to the road, when, looking up the hill, my eye was attracted by a good-sized patch of some plant swaying gently in the breeze, and of a somewhat yellowish hue. Hastily going up to it, I saw at once it was a new (to me) and strangely charming spurge. Charming it certainly did look, growing there in such a compact mass, barren stems bearing their mass of slender, pale green leaves, combined with fertile stems, with their delicate leaves and rays (some ten or more in number) of yellow-hued inflorescences. I gathered several good specimens for my own herbarium and those of friends, and now take this opportunity to make known to readers in general that if they wish to find it the plant may be found where I mention. The exact spot I will not name, or else, may be, the plant may in a few years totally disappear from sight. However, if any one anxious to find it will only search the hillsides close to Dover, on the right hand side of the way from Dover to Folkestone, the search will prove successful. The plant grows in a little natural grassy cleft on the hill, overlooking a small farm.—*K. E. Styan.*

The Formation of Chlorophyll.—With reference to an article in Science-Gossip upon the "Formation of Chlorophyll in Plants," and the "Germination of Seeds in a Melon," will you allow me to state that a short time ago, when in the South of France, I observed the same thing in a lemon which had been recently gathered, and when it was cut open I found that two of the seeds had germinated, and the cotyledons of both were perfectly green, and similar to the tracing in your paper of the young plant found in the melon. The lemon was a large one, and one of the young plants was fully the length of the interior of the lemon; the other was somewhat smaller, and the rootlets in both were well developed. The lemon was quite perfect and extremely full of juice, and neither light nor air could possibly have got into it. Perhaps it may be interesting to some of your readers to hear of this second case in point.—*G. C. Walker.*

GEOLOGY, &c.

The Rainbow Stone.—This is by no means an attractive-looking stone. It is a grayish, translucent ribbon agate, with just sufficient indication of bands to distinguish it from an ordinary chalcedony. My specimen is of an oval form, having been cut for a brooch stone; it is very thin and translucent. The part of the stone containing the iridescent band, from which it derives its name, and which is the only portion coloured, is about half-an-inch broad, and consists of fine navy bluish, parallel, thread-like lines. The band above the rainbow lines is a section of what was once quartz crystals, and the remainder of the stone below the layer is chalcedony profusely sprinkled with minute red dots. This is the stigmites, or St. Stephen's stone. When the specimen is held obliquely between the eye and a strong sun or gas light, the prismatic colours appear at first of an intense blue or green, in fine wavy lines, then, when turned in the hand, the reds and yellows make their appearance, and shine with equal brilliancy. The stronger the light the more beautiful the rainbow appears. The stone need not be placed very near to the light, as it can be seen in a room at a yard distant from a lighted gas. I possess many other specimens, both plain and banded, some of which are quite as thin as the specimen described above. These have all the appearance of the rainbow stone, but none of them show any colours when held up to the light.—*F. P. Marrat, The Free Public Museum, Liverpool.*

NOTE ON THE OCCURRENCE OF FISH-REMAINS, &C., IN THE FOREST OF DEAN COAL BASIN.—Whilst recently making a collection of plants from the Forest of Dean coal-field, I noticed a few scales of cœlacanthus and a tooth of diplodus in a bed of carbonaceous shale, or impure cannel, obtained from above the High Delf coal at the Trafalgar or Serridge Pit, near Cinderford. They were accompanied by an occasional coprolite, and a few thin, flattened, obscure shells belonging to two genera, one of which was finely striated, and might, perhaps, be an entomostracan. Except an occasional coprolite in other beds, this was all the evidence I saw of the presence of fish-remains in that basin, in which, as in those of the Bristol and Radstock areas, animal remains of any kind appear to be exceedingly scarce. In the Bristol district I have occasionally obtained good Leaias, a large and small species (if not the same), from Coal Pit Heath Colliery, and other thin obscure shells, apparently Lamellibranchs, occasionally from the S. Parkfield Colliery, and the pits near Yate. Also at the Howbeach Colliery, near Yorkley, in the Forest of Dean, I saw and obtained specimens of Leaia and other small shells from a gray shale overlying the Coleford High Delf seam. As far as I can gather from inquiry and from reading, this is the first time that fish-remains have been detected in either of the coal basins above mentioned, and it is to be regretted that the specimens obtained are both few and fragmentary; but they will serve to indicate a horizon where they may be expected to occur. For the exact localitating of the bed I am indebted to the kindness of Mr. A. Brain, manager of the Trafalgar Pit.—*T. Stock.*

THE SAIGA ANTELOPE IN BRITAIN.—At the Zoological Society's Meeting on November 4th, Mr. Smith Woodward exhibited and made remarks upon the calvarium and horn-cores of an adult male Saiga antelope (*Saiga tartarica*), from the Thames Pleistocene deposits near Richmond, Surrey. The specimen was forwarded to the British Museum for determination by Dr. J. R. Leeson, F.G.S., of Twickenham, who had obtained it from a recent excavation in Orleans Road. The fossil agrees so closely with the corresponding part of the skull of the recent Saiga, that no doubt remains as to the correctness of the identification; and the discovery makes known for the first time the presence of this antelope in the British Pleistocene Fauna. Bones and teeth of the Saiga are already well-known from several caverns in France and Belgium, found in intimate association with the evidences of Palæolithic man; and the occurrence of the animal in Britain was thus likely to be proved sooner or later. At the present day, *Saiga tartarica* is essentially characteristic of the Siberian steppes, though occasionally met with as far west as the borders of Russian Poland.

NOTES AND QUERIES.

QUERY AS TO A PLANT.—Would you please put a question in your column of Notes and Queries, regarding a plant I am curious about? Long years ago I copied a notice of it from an Indian paper here. It is:—"A medical officer of the French Government in the Madras Presidency, has discovered a cure for leprosy. It is a plant very common there, called *L'hydrocotyle Asiatique.* Two ounces of the dried plant to a quart of water, to be taken daily."—*Edith R. Allan.*

STRANGE WASPS' NEST.—There is here a wasps' nest of so very unusual an appearance, that I think it deserves a notice. It is situated in a chamber used as a hen-loft. Some pieces of sack had been nailed to the wall, on which the insects have built their nest, about twelve inches by eight inches in size, pear-shaped, crown upward; the entrance is situated near the bottom and close to the right angle partition wall, the materials are of the usual kind, resembling light-brown or straw-coloured paper. What strikes one as singular is the fact of the insects having worked all over the structure of the nest, tastefully arranged patterns of a much lighter colour, fairly resembling the inside rim of bivalve scallop-shells. This is as near an accurate account as I am at present able to give, as its situation is rather obscure, requiring a nearer approach than my courage would allow me to make among the active operations of a full company of these "Uhlan Lancers."—*G. Worledge, Woodbridge.*

LATE NIDIFICATION OF THE WOOD-PIGEON.—On October 19th an unfledged wood-pigeon (*Columba palumbus*) was found in a nest situated in a small fir tree, within a few yards of a cottage at Penton, Crediton, Devon. Probably owing to the unusual warmth and dryness of the weather, several pairs of wood-pigeons have succeeded in rearing their second or third brood during September in the neighbourhood; but the fact of so young a bird being in the nest so late as the 19th of October appears worthy of record. Macgillivray notes seeing a pair of young birds on the 26th of October, but states that they had down tips to the feathers, showing that they were much older than the unfledged bird above mentioned. As much earlier dates of nidification have been quoted as remarkable, the writer would be glad to know whether similar instances have been observed this season.—*Leopold A. D. Montague.*

Acarus and Bombus.—In answer to your correspondent, W. H. Seyfang, I may state that I have often observed the acarus he mentions in such numbers on various species of bombus, as to render them helpless, and unable to fly. I have never been able to ascertain that they injure the bee in any way, though they are said to destroy large quantities of the wax. It is probably for the purpose of being conveyed to the nests that they attach themselves to the bees.—*G. E. Frisby, Church Street, Maidstone.*

Late Appearance of Swallows.—On Sunday, October 26th, near St. Peter's, Broadstairs, a friend of mine saw two swallows flying. It was very squally at the time, with occasional showers of hail. Is not this very late? The recent wonderful weather would no doubt account for their delay in quitting us, but I never remember them so late before.—*F. C. F., New Malden.*

Cerura vinula in its Four Stages.—The egg of this moth is of a brick-red colour, and flattened on the side which is in contact with the leaf. The larva, which feeds on white willow, sallow, or poplar, is nearly black on emerging from the egg, but gradually becomes of a bright green colour, with a brown mark like a St. Andrew's cross on its back. It has a small lump on the third segment below the head, and at the hinder extremity of the body are two horny processes from which, when irritated, the creature can protrude two flexible red filaments, which have no power over the human skin. The length of the animal, when full fed, is nearly 2½ inches. When full fed, it spins a cocoon of silk and scraps of bark, which is very hard. Perhaps some one can tell me how the moth emerges from this cocoon. I have now in my possession cocoons of cardboard, brown and white paper, and one of the gummy excretion alone, which I obtained by placing the larva in a tin box covered with glass. Is it true that this caterpillar, when irritated, ejects a fluid from an aperture under the head? I have never seen this done, but have heard that it is so. When several of the larvæ are kept together, they gnaw each other's tails, and they also sometimes eat their cast-off skins. The moth appears about the middle of June, and the wings are white with black markings. It has the thorax and abdomen covered with white downy plumes, scantily spotted with black.—*W. H. Leyfang.*

White Field-Mouse. — Mr. Blaby will be interested to hear that some twenty-five years ago one of my father's tenants in Worcestershire caught a full-grown short-tailed field-mouse, and also a young one, both perfectly white. The former is still in my possession.—*K. A. Deakin, Cofton.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

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

We request that all exchanges may be signed with name (or initials) and full address at the end.

Special Note.—There is a tendency on the part of some exchangers to send more than one per month. We only allow this in the case of writers of papers.

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which now come to us from Devonshire to appear unless as advertisements.

Chigwell.—We are very sorry to say your rotifers cannot be identified from your figures.

C. E. Salmon.—Address Mr. James Grove, 16 St. Michael's Road, Stockwell, S.W.

H. A. Macpherson.—The paper on "The Food of Birds," appeared in the July number of Science-Gossip.

F. J. Provis.—Thanks for the very interesting specimen of *Verbascum thapsus* in the fasciated state.

E. S. Salmon.—Apply to Messrs. Wesley & Sons, Essex Street, Strand, or to Mr. W. P. Collins, 157 Great Portland Street, London, W., for a copy of the "London Catalogue of British Mosses." We are not sure, however, that Mr. J. A. Wheldon's "Catalogue of Mosses" (Ousegate Street, York) is not better.

E. Smith.—See reference to the address of Mr. J. Grove above, from whom all information respecting the valuable and cheap little book on British Characeæ can be obtained.

W. B.—Consult Sowerby's vol. on Cyperacæ. You will find it in most good free reference libraries.

J. O. B.—There can be little doubt that your specimen No. 1 is a Planarian, but it is impossible to tell the species from the drawing. No. 2 appears to be the larval form of the freshwater shrimp, or some other higher type than an entomostracan, as you suppose, judging from the elaborately segmented body shown in your sketch.

C. Magrave.—Taylor's "Geological Stories" is published by Messrs. W. H. Allen & Co., Waterloo Place, London, at 2*s.* 6*d.* A new edition is now almost ready, we believe the sixth.

B. C. R.—Thanks or your correction. The error was a hasty clerical one, such as a busy writer is apt to make.

Miss Morris.—Your interesting and valuable papers on "Fruit Trees" shall all be continued.

I. S. St. John.—A notice of "Larva Collecting and Breeding" appeared in the June number of Science-Gossip.

C. Dixon.—"Stray Feathers" was noticed in Science-Gossip for July last.

Capt. L.—We erred in stating the price of Taylor's "Playtime Naturalist" at 3*s.* 6*d.* It should have been 5*s.*

H. E. Griset.—You will find capital papers on "Skeletonising Leaves," in Science-Gossip, vol. for 1865, page 286, also in vol. for 1867 (in several places), and again in the vol. for 1871, page 252; vol. for 1872, pages 30 and 190, and vol. for 1874, pages 68, 113, 140, and 142.

EXCHANGES.

I have eggs of the song thrush, blackbird, starling, jackdaw, hedge-sparrow, missel-thrush, magpie, jay, chaffinch, robin; one each of the wood-pigeon, partridge, linnet, and twenty-six various, mostly tits, wrens, finches, &c., and two gold-crest, all obtained in this neighbourhood. Wanted, living pupæ of British lepidoptera, *Machaon cardui, Pavonia minor.* Desiderata numerous.—Offers to—F. Smart, 8 Clowance Street, Devonport.

Wanted, Aplin's "Birds of Oxfordshire," and G. Claridge Druce's "Flora of Oxfordshire." Will give in exchange Sowerby's "Illust. Index of Brit. Shells," 1859 ed. Lea's "Obs. on the genus Unio," 1829, twenty-eight coloured plates, or state desiderata.—W. E. Collinge, 41 Springfield Place, Leeds.

Offered, *P. fontinale*, vars. *Henslowiana* and *cinerea*, in exchange for different forms and vars. of spheridæ and pisidia, and of *H. arbustorum.*—Chas. Oldham, Ashton-on-Mersey.

Wanted, a good polariscope. Exchange, "Italian Classics," 3 vols., "Grammar of Etruscan Language," &c. List—J. Wallis, Deal.

Wanted, Oliver's "Lessons in Elementary Botany." Will give in exchange a Beale's neutral tint camera lucida, by Beck.—A. Montague, Crediton, Devon.

Wanted, Davis's "Biology," in good condition.—H. Parritt, 103, Camden Street, London, N.W.

Science-Gossip wanted for 1887 and 1888, in parts or bound, in good condition.—T. Keen, Chigwell, Essex.

Offered, L. C., 8th ed.: 191, 193, 380, 403, 563, 621, 650, 696, 726, 849*b*, 897, 967, 970, 1044, 1075, 1106, 1116, 1128, 1346, 1464, 1490, 1495, 1567, 1570, 1594, 1691, 1708, 1752, 1794, 1798, and 1804, in exchange for others.—H. Masterman, 26 Belmount Place, Kelso.

Science-Gossip wanted, from commencement to end of 1873; also for years 1878 to 1881, inclusive. Offered, fossils, shells, rocks, &c.—Rev. John Hawell, Ingleby-Greenow, Northallerton.

Offered, a fine collection of Scotch graptolites—lower silurian. Valuable shells required in exchange, or offers. Address—Miss F. M. Hele, Fairlight, 11 Elmgrove Road, Cotham, Bristol.

GREVILLE'S "Algæ Britannica," Landsborough's "History of British Sea-Weeds," Gifford's "Marine Botanist," Westwood's "British Butterflies," all with coloured plates throughout; also photographic lantern-slides of micro objects, offered for natural history works, especially in ornithology, and good micro slides.—Stewart, 17 Upper Gilmore Place, Edinburgh.

LEAVES of rhododendron hyb. (gives a splendid scale), vegetable ivory sections, *Chelifer latreillei*, and other material, given in exchange for one slide.—Geo. Parish, 124 Kingston Road, Oxford.

OFFERED, "Beetles, British and Foreign," by James Duncan, edited by Sir William Jardin. Contains a great number of coloured plates; condition equal to new. Wanted, slides to illustrate human anatomy and pathology.—R. Beer, Elmwood, Bickley, Kent.

WILL give a "Demon" detective camera, and a few recent numbers of "Nature," for named varieties of *H. pomatia, aspersa, nemoralis, hortensis, virgata, cantiana*, and other shells, or named minerals.—Chas. Pannell, jun., East Street, Haslemere.

NEW ZEALAND shells for exchange—marine, land, and freshwater. Wanted, foreign land and freshwater shells not in collection. A good exchange will be given for any of the following British species: *Vertigo Zilljeborgi, V. tumida, Succinea oblonga*, living examples of *Zimnæa glutinosa* or *Geomalacus maculosus*, living or in spirit.—W. A. Gain, Tuxford, Newark.

FOREIGN stamps wanted, also old English stamps. Will give shells, micro-slides, or books in exchange.—A. Alletsee, 1 South Villa, Kensington Road, Redland, Bristol.

Scalaria clathratula, Eulima polita, E. distorta, E. stenostoma, E. bilineata, Cerithium reticulatum, Cerithiopsis tubercularis, C. metula, C. pulchella, Turritella communis, Rissoa fulgida, R. soluta, R. cingillus, R. vitrea, R. proxima, R. crenulata, R. punctura, R. costata, Trophon muricata, T. rudis, Utriculus obtusus. Wanted in return, good specimens of "coal ferns" from coal measures, and good and perfect trilobites; also Grattan's "British Marine Algæ," for other British marine shells and polished geological specimens. Write to—A. J. R. Sclater, Bank Street, Teignmouth.

Cambrian, ordovician, and silurian fossils, and volcanic rocks from S. David's and Cumberland, for exchange. Wanted, triassic, jurassic, and cretaceous fossils.—W. H. Banks, Ridgebourne, Kington, Herefordshire.

WANTED, British and foreign shells not in collection. Offered, North American land and freshwater shells.—Thos. W. Reader, 171 Hemingford Road, London, N.

"GREVILLEA," vol. ii. Nine odd numbers to exchange for diatoms or other algæ.—Rev. H. W. Lett, Aghaderg Glebe, Loughbrickland, co. Down.

Senecio viscosus, L., from Lanarkshire, offered for good specimens of plants not in herbarium.—E. G. Gibb, 5 Kersland Terrace, Hillhead, Glasgow.

WANTED, Grattan's "Sea-weeds," or other modern work on marine algæ, in exchange for micro-slides, books, &c.—J. T. Neeve, 68 High Street, Deal.

WANTED, *Triton cancellinus, Fusus turricula, F. marmoratus, F. tuberculatus, Phos roseatus.* Offered, imitations of precious stones, ruby, sapphire, emerald, amethyst, turquoise, &c.—W. Jones, jun., 27 Mayton Street, London, N.

WANTED, good cabinet specimens of malachite, jet, tin ore, rock-crystal, amethyst, bismuth, copper pyrites, felspar, hornblende. Will give good exchange in Alston Moor minerals.—William Hetherington, Nenthead, Alston, Cumberland.

MICROSCOPE slides, chiefly diatoms, in exchange for other slides; diatoms preferred.—E. A. Hutton, Broadbottom, Manchester.

SCIENCE-GOSSIP wanted, bound or in parts, for 1881. Good specimens of minerals and carboniferous fossils in exchange.—P. J. Roberts, 4 Shepherd Street, Bacup.

WHAT offers in exchange for British birds' skins, mostly summer plumage—stonechats, wheatears, winchats, swallows, pied and yellow wagtails, pipits, tree sparrows, linnets, &c.?—H. Knights, 14 Beaconsfield Road, Yarmouth.

Octopus vulgaris, cuttle-fish, sea mouse, sea spiders, terebella, sea cucumbers, spawn of the pea and spider crabs, &c., in spirit, in exchange for marine shells, beetles, and British butterflies.—F. W. Alstead, 31 North Street, Jarrow.

WANTED, Rutley's, Bristow's, or any standard work on mineralogy. Good natural history books, &c., will be given in exchange.—W. J. Weston, Beckley, Sussex.

WANTED, micro-slides in exchange for vols. of "Chemical News," and "Journals of Chemical Society," in good condition, or offers.—Stanley James, Broad Street, Worcester.

WILL exchange a series of fossils from "the great oolite limestone" of Northamptonshire, for a similar series from the same formation in other localities, Minchinhampton preferred.—A. Soydell, 19 Chaucer Road, Acton, W.

DUPLICATES, lepidoptera. Ulmatas, fine, and vespertaria, fair; also eggs of guillemot, including fine varieties, and numerous land and freshwater shells. Desiderata numerous.—William Hewett, Howard Street, York.

DUPLICATES.—*Zonites draparnaldi*, Clayton-le-Moors' habitat, *Helix fusca, H. sericea, Vertigo edentula, Planorbis dilatatus, Limnæa palustris*, var. *minor, L. truncatula*, var. *minor, Helix hortensis*, var. *minor, Paludina contecta.* Wanted, *Limnæa involutus, L. peregra*, vars. *Burnetti, lacustris, maritima, lutea, succiniformis*, and *Succinea oblonga.*—R. Wigglesworth, 13 Arthur Street, Clayton-le-Moors, Lancs.

WANTED, good specimens of *Limnea glutinosa.* Offered, earth from Loch Kinnord, Aberdeenshire, containing diatoms.—John R. B. Masefield, Rosehill, Cheadle, Staffordshire.

WANTED, part 7 of Kirby's "European Butterflies and Moths." Will exchange SCIENCE-GOSSIP for April and May, 1889, for same.—F. Kemp, 133 Brecknock Road, N.W.

Helix limbata, vars. *serratina* and *albina, Pomatias obscurum, Hyalina olivetorum*, from Pau, in exchange for rare English land and freshwater shells.—Rev. J. W. Horsley, Woolwich.

WANTED, any books on the microscope, and foreign shells, in exchange for British marine shells, and choice microscopic slides of all kinds.—R. Suter, 5 Highweek Road, Tottenham, London.

DUPLICATES.—*Anodonta anatina, Neritina fluviatilis, Bythinia Leachii, Valvula piscinalis, V. cristata, Planorbis nitidus, P. carinatus, P. corneus, P. contortus, Physa hypnorum, P. fontinalis, Limnea glutinosa, L. stagnalis, Ancylus lacustris, Succinea putris, S. elegans, Helix cantiana, H. virgata, H. ericetorum, Clausilia rugosa, Hydrobia ulva, H. ventrosa*, &c. Desiderata, other shells or natural history specimens.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

OFFERED, Kirby's "Text-Book of Entomology," 1885, almost new. Wanted, good micro-slides, or offers.—J. Lahore, 171 Waddell Street, Glasgow.

OFFERED, corals, polyzoa, shells, sponges, Drusy cavities in flint, flint showing sponge structure, for polishing all from the chalk, in exchange for good geological specimens, corals or shells.—W. Gamble, 2 West Street, New Brompton, Kent.

DUPLICATES of named British diptera. Desiderata, named British micro lepidoptera, hymenoptera, hemiptera, orthoptera, neuroptera.—C. J. Watkins, King's Mill House, Painswick, Gloucestershire.

PINE microscopical cabinet, well fitted, with room for 504 slides, in 21 drawers. Also about 250 slides representing all departments of microscopy. What offers? Send for list of slides to—W. Henshall, The Hollies, Bredbury, near Stockport.

ANT-LION larvæ and shells of *Helix hæmastoma*, Ceylon, in exchange for mounted entomological slides.—Dr. Clements, Frindsbury, Rochester.

BOOKS, ETC., RECEIVED.

"A Catalogue of Maps, Atlases, Books, &c.," issued or sold by E. Stanford, Charing Cross.—"The Book-Lover's Leaflet," by Messrs. Pickering and Chatto.—"Our Fancy Pigeons," by Geo. Ure (London: Elliot Stock).—"The Philosophy of Clothing," by W. Mattieu Williams (London: Thomas Laurie).—"Magnetism and Electricity," by J. Spencer (London: Percival & Co.).—"Practical Inorganic Chemistry," by E. J. Cox (London: Percival & Co.).—"Illustrated Handbook of British Dragonflies," by the editor of "Naturalist's Gazette" (Birmingham: Naturalist's Publishing Co.).—"The Effect of Use and Disuse," by W. Platt Ball (London: Macmillan).—"The Birth and Growth of Worlds," by Professor A. H. Green (London: S.P.C.K.).—"Elementary Treatise on Hydrodynamics and Sound," by A. B. Basset (Cambridge: Bell, Deighton & Co.).—"London of the Past," by J. A. Ainscough (London: Elliot Stock).—"Natural History of the Animal Kingdom," by W. F. Kirby (London: S.P.C.K.).—"Bulletins of the U.S. Geological Survey," Nos. 54-57 (Washington).—"Annotated List of the Birds of Hampshire and the Isle of Wight," by the Rev. J. E. Kersall.—Wesley's "Natural History and Book Circular."—American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 14TH ULT. FROM: J. K.—J. T. R.—A. B. G.—Dr. G. C. M.—J. W. S.—W. H.—J. W. W.—F. W. M.—H. M.—H. W. P.—E. S.—M. B. M.—T. A. L.—L. A. D. M.—E. S. S.—J. H.—A. W. W.—A. M.—T. S. S. J.—K. S. S.—P. Q. K.—R. A. P.—W. E. C.—J. W.—J. M. M.—J. E. K.—F. G. S.—F. C. F.—W. H. C.—F. M. H.—F. J. W.—J. O. B.—R. B.—C. P., jun.—W. A. G.—E. A. H.—H. W.—B. C. R.—H. E. G.—W. H.—P. T. R.—W. H. B.—A. A.—J. W. B.—F. K.—Capt. L.—Rev. J. W. H.—A. S.—W. J. J., jun.—T. E. S.—J. T. N.—W. H.—J. R. B.—E. G. G.—T. S.—H. W. L.—W. I. W.—F. W. A.—J. C. K.—R. W.—S. J.—R. H. M.—R. S.—T. L. A. H. S.—W. W., jun.—E. M. W.—H. C.—C. E. S.—W. G. C.—J. E. R.—G. W. R.—E. W. S.—H. D.—M. M.—M. W.—W. T.—J. H.—&c., &c.

INDEX TO VOL. XXVI.

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