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Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

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ADIEU.

From J. E. Taylor, F.L.S., etc.

OWING to ill-health I have found myself unable to continue the editorship of Science-Gossip.

In bidding adieu to its numerous readers and contributors, with numbers of whom I have been in pleasant correspondence for nearly a quarter of a century, it is with pleasure I find myself succeeded in the editorial chair by so able a naturalist as Mr. John T. Carrington.

I shall always regard our widely circulated Magazine with something of personal affection, for my long connection with it has secured me hosts of personal friends and acquaintances.

Mr. Carrington is too well-known to need any personal introduction, and it is pleasant to think I may often come into contact with old friends through my own contributions to its pages.

No other Scientific Magazine occupies the position of Science-Gossip. It not only records the newest discoveries in every department of Natural Science, but opens the door to all young naturalists wishing to record their own observations and discoveries. Hence there has always been a freshness and vigour in its pages which no other Scientific Journal can lay claim to. Not a few of our leading naturalists made their first essays in its pages. The volumes of Science-Gossip, from its commencement, in 1865, are the completest historical record of the progress of Natural Science in our language. Every branch of the subject has been discussed in its pages, and every new discovery has been therein recorded.

Over the long period of its vigorous existence it has formed a library in itself. Science will grow from more to more, and the scope of our Magazine will broaden with the coming years.

Under the able editorship of my successor our Magazine will take a fresh lease of life. That its life may be long is my sincere hope.

Adieux are always painful to utter, and it cannot be wondered at, therefore, if I feel regret at having to say to all my old readers and contributors,

Farewell!

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In consequence of the illness of the Editor, eight monthly parts only of SCIENCE-GOSSIP *were issued in the Year* 1893.

ANIMALS AND MEDICINE.

By HULWIDGEON.

II.—UNGULATA (*continued*).

BOAR.—Apart from his relatives, the domestic swine and the East Indian stone-yielder, the European wild boar was supposed to possess some peculiar merits. "The boar's bladder," writes Howard, vol. i. p. 358, "has been reputed by physicians a specific for the epilepsy; and the tush of the wild boar still passes with some as of great efficacy in quinsies and epilepsies."

Bate gives a *Testes apri præparati* (p. 639), which was obtained from a "boar or wild boar" and prepared after the manner of that mentioned under Horse; like which, it was administered for epilepsy, colic, and bowel disorders. Of this composition Salmon remarks: "They have all the virtues of the former (the *T. equi præp.*), and, in my opinion, are somewhat the more powerful." He gave ½-scruple doses, in a vehicle, to women for fits.

HIPPOPOTAMUS.—The semi-apocryphal "sea-horse" was renowned as the producer of the whitest and most enduring of white ivories, in which capacity it serves our dentists down to this day. But at the time I write of, Behemoth itself was known but indifferently to the profession, and many learned members, while compounding actual products of the animal, must have accepted their pretended source in blind faith or, privately, have regarded it as a myth. The ridiculously inaccurate accounts of it, slavishly borrowed from Aristotle and Pliny, which served until the eighteenth century to stand for its natural history, could hardly fail to be discredited by men of education and intelligence. Our "Nature Display'd" (p. 244), treating of it from later authorities, altogether avoids a personal description. The hippopotamus is "a very large amphibious animal, who lives at the bottom of the Nile and Niger, from whence he rises, not by any effort of swimming, but by crawling with his four feet, when he goes to feed in the meadows or even the tops of mountains. He grazes in the herbage, and then returns to his station in the water, where he is in a perpetual state of war with the crocodile."

Bate makes use of the hippo's ivory, as in a recipe for kidney affections (p. 637), in which he prescribes two ounces of ivory, and half an ounce of "sea-horse tooth rasped." The same author, in one of his quiddanies for wasting, weakness, and consumption (p. 612), gives us, besides the raspings, an ounce of the genitals of the same creature.

SHEEP.—To the sheep we are chiefly beholden for fat and wool. Of the healing value of the former a high opinion prevailed. Fat, says Hooper (p. 317), "is nourishing to those that have strong digestive powers. It is used externally as a softening remedy and enters into the composition of ointments and plasters." From Howard (vol. ii. p. 883) we gather that fat is "an oily sulphureous part of the blood, deposited in the cells of the *membrana adiposa*." It is of two kinds, "one white, or rather yellow, soft and lax, which is easily melted and is called pinguedo; another white, firm, brittle, and which is not so easily melted, called sebum." Amid other interesting disclosures he instructs us: "The way of preparing fat for medicinal purposes is to take out the skins, veins, fibres, etc., wash it till it becomes unbloody, then melt it by a gentle heat, with a little water, till the water is evaporated; strain, put it into an earthen vessel, where it will fix, and preserve it from air." *Oleum animale*, says Hooper (p. 568), is "an empyreumatic substance, obtained by distillation from animal substances. It is sometimes exhibited as an anti-spasmodic and diaphoretic, in the dose of from ten to forty drops."

Of the fat of sheep in particular, it was distinguished by physicians as *Sebum ovile* or *S. ovillum* (though a butcher could not tell it from "mutton-suet"), and was of universal occurrence as a medium for administering more active remedies. Salmon preferred it (or beef-suet) to other fats in mixing drugs for keeping, as it was not reckoned liable to go rancid for a year or more. In Bate's *Emplastrum soleare* (p. 702) for the feet, the sheep's fat should apparently be lifted out of the category of mere vehicles. For other examples I need only refer to Bate, pp. 363, 705, etc., and to the ointments in Buchan's appendix.

Wool was accredited with the possession of many curative properties. *Œsype*, *-ypos*, *-ypum*, or *-ypus*, Hooper relates (p. 568), "frequently is met with in the ancient pharmacy for a certain oily substance boiled out of particular parts of the fleeces of wool, as what grows on the flank, neck and parts most used to sweat." The attribution of healing powers to this product was by no means confined to the compilers of ancient pharmacies. Thus, Bate's spinal balsam (p. 685), having been exhibited for rickets and similar complaints, we are directed to "lay over it greasie wooll as it is new shorn off the sheep's back, and binding it fast to with a double linen cloth sewed on."

Buchan (p. 347) recommends the following simple treatment for the gout: "The leg and foot should be wrapt in soft flannel, fur or wool. The last is most readily obtained and seems to answer the purpose better than anything else. The people of Lancashire look upon wool as a kind of specific in the gout. They wrap a great quantity of it about the leg and foot affected and cover it with a skin of soft dressed leather. This they suffer to continue for eight or ten days, and, sometimes, for a fortnight or three weeks or longer, if the pain does not cease. I never knew any external application answer so well. The wool which they use is generally greased and carded or combed. They choose the softest which can be had and seldom or never remove it till the fit be entirely gone off.

For galling of the flesh, Howard (vol. ii. p. 970) has it that the application of raw wool, or the lungs of a lamb still warm, are remedies.

For staying fluxes (or dysentery) sheep's-heads achieve a high reputation. Buchan pinned his faith in sheep's-head jelly as a cure. Take, he bids us (p. 315), "a sheep's head and feet with the skin upon them and burn the wool off with a hot iron; boil them till the broth is quite a jelly. A little cinnamon or mace may be added, to give the broth an agreeable flavour, and the patient may take a little of it warm, with toasted bread, three or four times a day. . . . This might be shown to possess virtues every way suited to the cure of a dysentery which does not proceed from a putrid state of the humours. . . . We know that whole familes have often been cured by it after they had used many other medicines in vain. It will be necessary to continue the use of it for a considerable time and to make it the principal food."

Bate provided a remedy of the same character in his *Enema dysentericum* (p. 708). His prescription ran: "℞. A sheep's-head killed with the wool and broken to pieces; the tongue and brain being taken out, boil it in water (any quantity up to six pounds), and strain out for clysters." To make the then orthodox mess of it we were further told that we might add camomiles, mallows, and other things to the liquid.

Salmon's specific for the bloody flux was his *Enema spirituosum* (p. 709), a mixture of five drops each of oils of turpentine and aniseed in eight ounces, each, of spirits of wine and "broth of a sheep's head," exhibited warm. With this, he tells us, he performed marvellous cures; amongst others that of "one poor man who had lain twelve weeks languishing under that distemper. I, being sent for, found the man, as I thought, dead, at least a-dying and senseless, his eyes closed, his teeth set. . . . I presently caused this clyster to be exhibited. He seem'd to sleep and lie quietly after it, resting twelve hours with it in his body and awaked easie. . . . Afterwards, once a day for a week, and in a short time he perfectly recovered."

Ewe's milk was prescribed as a luxury, being, according to Hooper's analytical account, the richest of milks obtainable. It possesses, going by the same authority (pp. 498–500), the least serum of all and a great deal of cream. Its butter was soft and its cheese almost of a glutinous consistency, but excellent in quality.

Lamb's blood occurs in one of Bate's consumption draughts (p. 9), and Salmon tells us the blood of a sheep will answer in default of others, in another antiphthisical prescription (p. 2).

Freshly dropped sheep's dung is the largest component of Bate's *Extractum ictericum* (p. 279), a jaundice remedy.

One of Bate's consumption cures, along with a medley of other ingredients, includes four feet of sheep boiled, strained, sugared and skimmed (p. 612).

For the consideration of the sheep's bezoar I am constrained to refer to the general account of those stones which is to follow.

Goat.—The high medical reputation of goat's milk is not of a recent birth. Says Howard (vol. ii. p. 1066): "Their milk is esteemed the greatest nourisher of all liquids, women's milk excepted, and very comfortable to the stomach." Hooper (p. 500) states that it "resembles cows', except in its greater consistence; like that milk, it throws up abundance of cream, from which butter is easily obtained." Its cheese was solid and elastic; its general characteristic, a richness only equalled by that of the ewe's milk.

Howard (vol. ii. p. 1066) writes of domestic goats: "They are recommended to lie among horses, their smell, as is supposed, preventing many diseases in those animals. The blood of the he-goat, dried, has been recommended for the pleurisy and inflammatory disorders." The celebrated Dr. Mead, in his treatment for pleurisy, prescribed, "for dissolving the sizy blood that obstructs the small canals, wild goat's blood and volatile salts."

The diacoprægiæ were preparations of goat's dung, but for what purposes they were administered, and what were their reputed qualifications therefor, I am as yet unaware.

The suet of goats, and perhaps the hair and horns likewise, were also made available by the faculty. The bezoar of the domestic goat shall be treated of under the head of the Bezoar-goat.

Chamois.—This all but inaccessible animal subject was still, as the provider of "shamoy leather," made to pay his slight tribute to the tyrant surgeon. The use of this material will be best illustrated by the incidental mention made of it in treatments quoted elsewhere.

The chamois-stone is deserving of separate mention. This stone, alias the German bezoar (writes Howard, vol. i. p, 333), "is called by some cow's egg, said to be found in the stomach of cows, but more frequently in that of the chamois or wild goat. These are supposed to be caused by the hair of those creatures, which they lick off by the tongue, and, being swallowed down and impregnated with the saliva, etc., is condensed into balls. Some of them weigh eighteen ounces, and, though used in some medicines, are not much esteemed.

EXPANSION OF AIR BY HEAT.

The expansibility or distension of solids, fluids, and gases by heat is a very extensive physical law, although generally unobserved, and is of the greatest importance in chemistry. Examples of the expansion of air by heat are very numerous; the following are some of the more simple processes of this kind, which I have found will illustrate this law as plainly as possible.

A small stoppered bottle of two or three cubic inch capacity, is to be filled with pure air (at a low temperature), which may be practically done by the application of the lips to the mouth of the bottle, so that one half only of it is covered (the other part remaining open), and the air drawn out by suction; its volume is then replaced by external air drawn in through the remaining aperture to supply its place. This being done, the stopper can be wetted and loosely replaced. The bottle should now be tightly held in the warm hand, and the stopper will then be seen to pop up two or three times, emitting a jet of expanded air each time. If under the same circumstances, the stopper, instead of being loosely replaced, is a little tightened, it will completely jump out by the application of the heat as above. Now if oxygen, or hydrogen gas (both of which are very

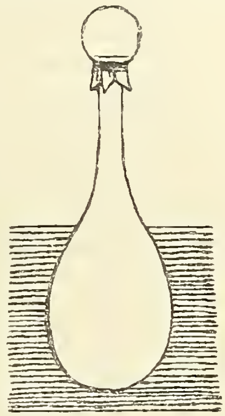


Fig. 1.—A glass bulb immersed in hot water with a piece of wet membrane over its mouth, blown out by the dilation of the contained air.

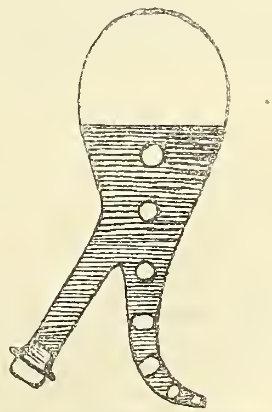


Fig. 2.—A glass vessel after being immersed in boiling water. The air has been reduced to less than half its volume, as shown by the contained fluid.

combustible) is substituted for common air, the same experiment repeated, and an ignited match held over the stopper, each jet of gas will produce a small blue flame.

A second simple method is to take a thin glass bottle, loosely tie a thin piece of caoutchouc, or wetted membrane over the mouth, and then immerse it in water at the temperature of ebullition (100° C.), the membrane will bulge out, and ultimately burst if it be very thin (Fig. 1). On the other hand, if the same bottle is immersed in eold instead of hot water, contraction of the enclosed air will consequently result, and the membrane will be drawn in more or less deeply concave. Not only does this law apply to gases, (which are most sensible to it), but also in a less degree to fluids, and less still to solid bodies as above remarked.

Another good way of illustrating the same law, and perhaps the most obvious of all the preceding, is to obtain a thin glass vessel, with a double communication, that is to say with two mouths. By suction, the air is drawn through this vessel by the widest opening, which is then well-corked, and the whole immediately placed under boiling water ; from the small unstopped aperture, numerous small bubbles of air will issue in rapid succession, due to the heat causing the contained air to dilate. When, after the bottle has been immersed a minute or two, the body is held out of water, considerable contraction of the expanded air will ensue, and consequently an equivalent quantity of water will be drawn in ; if after remaining thus a short time, the vessel is taken out (still inverted) of the fluid, further condensation of the air will result, and small bubbles will continue to be drawn through the water, until the bottle and its contents have attained a temperature alike to that of the surrounding atmosphere (Fig. 2). The water drawn in and the remaining air will be nearly approximate to the air it first eontained.

Upon this law is based the construction of the "air-thermometer," and thermometers generally.

HENRY E. GRISET.

NOTES ON THE RECENT OCCURRENCE OF SOME FOREIGN SPECIES OF ROTIFERA IN ENGLAND.

By PERCY G. THOMPSON.

AT a period like the present—when, owing to the impetus given to the study of rotifers by the publication of Hudson and Gosse's elaborate monograph, new forms are continually being brought before our notice—there is danger that the often long-since described forms of foreign authors may drop out of the local worker's memory, or be passed over as of unlikely occurrence to his own rescarch. It is, however, of prime importance that these earlier forms should be continually kept in vivid remembrance, and that, if happily met with, they should without delay be recorded as additions to our British list, and, if possible, our knowledge of their structure extended.

Mr. George Western has done useful work in this direction in demonstrating the presence in our own country of *Œcistes mucicola*, Kellicott, which makes its home in the gelatinous matrix of certain fresh-water algæ (Gloiotrichia and Chætophora), and which up to last year had been recorded solely from America ; Mr. Western has also found the probable male of this Œcistes.

The present paper is intended as a further contribution towards this extension of our indigenous rotifer-fauna by the inclusion of certain species hitherto only known as foreign.

Anuræa valga, Ehrenberg. The pretty little

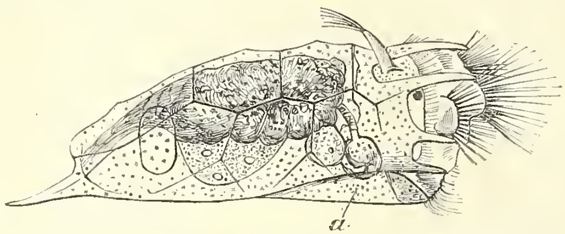


Fig. 3.—*Anuræa valga.* Side view, taken obliquely from the right side : *a*, ventral plate.

Anuræa which I regard as identical with the above species, I have met with on several occasions and in considerable numbers from shallow ponds on Leyton Flats, near Snaresbrook. It is also recorded (but without specific identification) as found by the members of the Quekett Club on several of their excursions to localities round London, and I have had it sent up to me from the Isle of Wight, so that

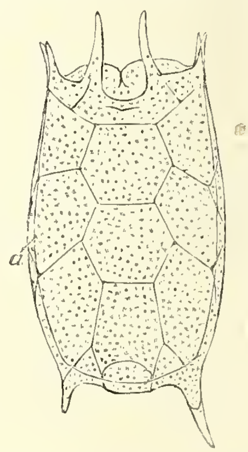


Fig. 4.—*Anuræa valga.* Dorsal view of empty lorica, showing tesselation : *a*, lateral edge of ventral plate.

the form is probably widely distributed through this country. It will be well to examine in some detail the anatomy of my Snaresbrook specimens, and to eonclude with a few remarks on the questionable right to specific distinctness of this form and of certain of its near allies.

The lorica scarcely differs in its size and proportion from that of the well-known *A. aculeata* (Ehrb.). Like the latter, it consists of two plates, a larger slightly elevated dorsal, and a flat ventral plate of slightly smaller dimensions, the two being connected together at their lateral margins by flexible membrane. The dorsal plate is armed in front with six projecting spines, of which the two median ones (antlers) are fully twice the length of the remaining four, and much decurved so as to arch over, and protect, the animal's coronal head, when the latter is normally protruded in rotation. The four lateral frontal spines are all of equal size ; the space between the central antlers forms a square bay. Behind, the dorsal plate of the lorica is produced at each rear lateral angle into a spine ; that on the animal's right side being *always* much the longer and hollow for one-third of its length from the base, while the left spine is usually only half as long as its fellow, and

Fig. 5.—*A. valga.* Trophi.

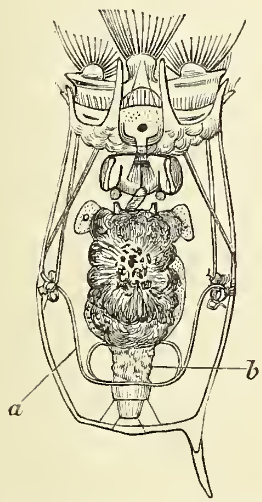


Fig. 6.—*Anuræa valga.*—Dorsal view, omitting lorical markings: *a*, lateral canal; *b*, contractile bladder.

may even be altogether missing. The specimens with, and without, this left posterior spine occur intermingled, and differ from each other in no other point.

The facetting of the dorsal plate is precisely that of *aculeata*, composed of a longitudinal series of hexagons occupying the middle line of the back, with imperfect lateral polygons; the hexagons are not always geometrically accurate, their bounding lines being often of unequal lengths, as is also the case in some specimens of *aculeata*. In addition to the facets, the entire dorsal plate, and also at least the frontal portion of the ventral plate, is studded with small but prominent dots, which are as usual more developed, forming, in fact, small teeth, along the lateral edges of the ventral plate.

The total length of the lorica, including the longest spines, is $\frac{1}{130}$th inch.

Now as to the enclosed animal. The corona when fully extruded from between the plates is seen to be in all respects like that of the other species of Anuræa, with three style-bearing lobes, one dorsal and one on each side, projected from the ciliated face. The mastax is a comparatively large, cuboidal sac, furnished with salivary glands attached to its rear surface ; the contained trophi, when pressed out, are seen to be of the normal malleate type, with five-toothed unci, and stout manubria of equal length ;

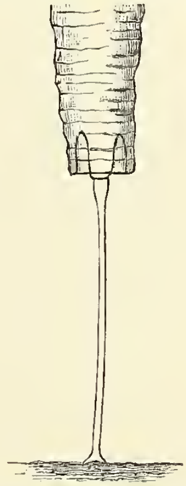


Fig. 7.—*Melicerta pedunculata:* (foot-pedicel).

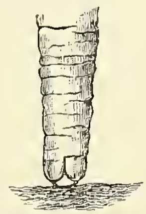


Fig. 8.—*Melicerta ringens:* (short foot-pedicel).

the incus-rami are also cut along their inner edges into a number (about six) of very minute serrations : fulcrum short.

The remaining digestive, reproductive, and renal organs are perfectly normal and need no special description here ; the contractile vesicle expands to a large proportionate size, and the attached lateral canals join it, on each side, *at its point of junction with the cloaca*, even if they be not indeed entirely free from it. This imperfect connection between the lateral canals and the contractile bladder, which has been also noticed by Gosse in *Brachionus urceolaris*, and even more markedly by Semper in Trochosphæra, seems to me to strongly confirm Dr. Hudson's recent conception of the branchial function of the bladder apart from the renal one of the canals and their tags.

It will be seen from the above description that this Anuræa, which seems to fairly well agree with Ehrenberg's short account of his *A. valga*, yet bears, in all points, save the unequal lengths of the rear lorica-spines, a very close resemblance to the same author's *A. aculeata*. This latter common form, too, is remarkably subject to variation in this very character of length of posterior spines; specimens from some localities have these processes equalling in length the rest of the lorica, while others have mere stumpy points (Gosse's var. *brevispina*); and I have myself met with a number of individuals from a well in Bedfordshire in which all traces of these rear spines were totally wanting, yet these were indubitable *aculeata*, and I was able to demonstrate that the missing spines were wanting in the unhatched young within the egg, as well as in the adult.

From the foregoing considerations it seems to me that *A. valga* is only entitled to be regarded as a variety or race of the aggregate species, *A. aculeata*, since neither in tessellation nor in other respects except the inequality in length of its rear processes, does the former appear to differ from the latter; the specific identity of the two forms has been indeed already suggested as probable by Gosse.

But we may, I think, go further. Surgeon Gunson Thorpe has recently described as new a couple of Anuræas, *A. procurva* and *A. scutata*, from Ascension and Brisbane respectively, both of which agree with the form we have just been considering in possessing unequal rear spines to the lorica. Like *valga*, too, these bear a resemblance to *aculeata* in their frontal armature and their lorica faceting. *Procurva* seems sufficiently distinct; but as regards *scutata*, while not suggesting that this form of Surgeon Thorpe's is absolutely identical with *valga*, it seems not improbable that both will hereafter be found to constitute distinct varieties of one aggregate species, *aculeata*.

Sacculus hyalinus, Kellicott. In July 1891, from the same pond as that from which most of my specimens of the Anuræa, just described, were obtained, viz., on Leyton Flats, I met with numerous individuals of this Sacculus, hitherto known as occurring only in the United States. On one or two occasions since, I have seen a few solitary individuals of the same species, both from the same and neighbouring ponds and from Cuckoo Pits, Chingford. I have had them present in the same gathering with *S. viridis*, so have been well able to appreciate the points of difference between the two species. As regards the anatomy of this creature, I have nothing to add to Professor Kellicott's account published in the "Proc. Amer. Soc. Microsc., 1889," and abstracted in the "Supplement;"* the description there given is exact. I am able to confirm Professor Kellicott's cautious statement as to the occurrence of setæ upon the coronal face. He says, "The corona has a circlet of ample cilia, and at the dorsal border there is a conspicuous spatula-shaped apex which, seen laterally, is thin and turned downwards; on each side of this is what appears to be a stout incurved seta." These words accurately describe what I find on the coronal face of my Snaresbrook specimens. The collapsing of the soft integument at the instant of contraction of the contractile bladder is markedly noticeable. Some of my specimens have but badly merited their specific name, for they have been as crowded with green food as their ally, *viridis;* others have been of a clear transparent yellow tint.

Melicerta pedunculata, Joliet. I have seen one or two individuals of this Melicerta, again from the same pond on Leyton Flats. I made out no character worthy of separating this form from *M. ringens*, other than the fact that the animal is mounted upon a long non-retractile pedicel, as long as the foot itself, (Fig. 7) similar to that of *Floscularia longicaudata*, and over which the fleshy foot is capable of being retracted by a process of invagination, as shown in the sketch. But this rigid pedicel of chitine, usually of very insignificant length, is frequent among the tube-dwelling rotifera, terminating the foot. *Melicerta ringens* itself possesses it as a short stump with dilated base, (Fig. 8) capable of being easily overlooked. Joliet's name may be retained as indicating a long-pedicelled variety of *M. ringens*, though Hudson and Gosse omit to mention it in their monograph, even as a synonym.

Copeus Ehrenbergii, Ehrb. This large and handsome rotiferon occurred to me in July 1892, from the ponds on Leyton Flats, near Snaresbrook. Ehrenberg's figure and description of this form are amply sufficient to identify it; in my specimens the huge "telegraph-like" auricles were freely projected from the sides of the head as the animals swam at large in a deep trough, and the great "lip" from the ventral face of the corona (quite as large as that figured by Gosse for his *C. labiatus*), was frequently thrust out; the mucous investment of the body was also distinctly present. Mr. Western writes me that he and others had previously met with this Copeus at excursions of the Quekett Club to various localities round London, but that he doubts the specific distinctness of this, and Gosse's, form. However probable it may seem that *Ehrenbergii* and *labiatus* are but different conditions of one species, due to temporary circumstances of locomotion, our present data are insufficient to justify the inclusion of the two forms under a single specific name, and in any case the name which heads this paragraph would have priority over that of Gosse.*

Notommata torulosa, Dujardin. Numerous speci-

* "The Rotifera: Supplement, 1889."

* Since writing the above, I hear that this rotifer has been described as British by Mr. W. T. Calman in the "Ann. Scott. Nat. Hist." for October, 1892.

mens, male as well as female, of this obscure creature fell to my lot during the summer of 1889, from Wanstead Park, Essex. Mr. D. Bryce had met with female examples a year earlier, and has since come across solitary individuals on several occasions and from different localities. My present purpose is merely to call the attention of other workers to the fact of the occurrence of this species in districts near London. The specimens seen by Mr. Bryce appear to differ in certain structural details from those which I myself examined; and as this discrepancy, if proved to be actual and constant, may affect the now-accepted name of the species in a manner which I cannot here discuss, it is advisable to defer any description of this form until the acquisition of further specimens shall have made us more familiar with its anatomy.

WOODLAND WANDERERS, OR THE MYCETOZOA.

No. II.

[*Continued from p.* 251.]

SENSITIVE creatures are these plasmodia; requiring special environment to enable them to flourish. Moisture is essential, with a temperature not too low. Frost apparently drives them into hiding, whilst too much dry heat desiccates the surface of the matrix, and thus compels them to seek sustenance in the moist interior of the decayed vegetation. This may be rotten wood or decaying leaves, but in any case it must be organic. None of them contain chlorophyll, and hence have not the power to assimilate food from the inorganic substances of the earth, or the impalpable forces of the light and air. There are cases on record in which the sporangia, or fruiting heads, have been found on lead pipes and old shoes, but these do not imply that they fed on such intractable articles, but that having previously absorbed sufficient nutriment, it is a matter of indifference to what materials they may creep in order to form their capsules. The plasmodium stage is essentially the feeding one, and during this period the protoplasmic contents are particularly rich in formative materials. One may even suggest that there is a distant analogy between this life-period of the organism and the larval stage of the Lepidoptera. The plasmodia, having no protective cell-covering, are peculiarly sensitive to injury by contact. It is really wall-less protoplasm, and hence the slightest touch from the incautious finger causes local death, although the other portions may remain healthy. The fact that its contents are not restricted by cell-walls may account for their excessive mobility, enabling them to insinuate themselves into the interstices of wood, that may be only in an incipient stage of decay, and also into the honeycomb-like cavities of the fungi (Irpex) on which they often occur. Their course over these fungi is always indicated by a marked change in them; their normal hue is a creamy white, but when plasmodium has passed over them they change to a dirty drab, and are apparently in a moribund condition. The discoloration of the food-plant may also be partly due to a slimy substance which is left by the Mycetozoon as it shifts its position, as though it threw off the waste material that would otherwise accumulate in its own substance. This rejection of useless contents is particularly marked in the fruiting stage.

Although so singularly sensitive to contact, it will endure strange vicissitudes without injury. It may be dried up, till it is apparently hard and tough,* in which condition it may be kept for an indefinite period—weeks and even months—after which, by the application of moisture, with careful treatment, it may be resuscitated and it will become as active as ever. During the closing part of the summer of the past year we were desirous to obtain some plasmodium, but were unable to do so owing to the dryness of the season. A request for some of it was sent to an esteemed correspondent, who is a specialist in this department of science. In reply, a small portion of desiccated plasmodium attached to a fungus was forwarded in a pill-box. This had been dried artificially several weeks previously. Wishing to see if it would revive, it was placed in a shallow glazed vessel four or five inches wide. On the opposite side of the vessel a portion of a suitable fungus was placed, and the intermediate space was filled with fragments of decayed wood. The whole was then immersed in water, or rather water was poured over until the contents of the dish were covered. It was noticed that after two or three days the plasmodium had imbibed sufficient moisture to enable it to become partly detached from its position. In about a week it threw out a vein-like process, which traversed the intervening space over the fragments of wood, and reached the fungus on the opposite side of the vessel. In a few more days the whole creature had left its original position and had transferred itself to the fresh food which lay within its vicinity, although several inches distant. By what occult power it could direct its course in the desired direction, and that after weeks of apparent suspension of animation, is beyond the comprehension of the present observer.

In addition to the movements of the whole mass, or certain portions of it, in search of sustenance, which changes of position may be noted by the naked eye, or better still by a pocket lens, there is also a circulation of the protoplasmic contents. It can, however, scarcely be called circulation in the ordinary sense of the term, as the eourse is not always in one direction. There is an ebb and flow

* Technically termed sclerotium.

in curious rhythmic cadence. Two or three branching veins will have the central portion hurrying forwards, it may be towards the right of the observer, then suddenly they may be arrested in their course, and return towards the direction from which they came. As, however, this description can only apply to the small portion visible at once in the field of a microscope, it would be presumptuous to imply that this would adequately describe the movements in the whole mass.

JAS. SAUNDERS.

Luton.

(*To be continued.*)

THE PERIODICAL APPEARANCE OF EDUSA.

WITH regard to the question now in debate as to whether the abundance of Edusa last autumn was, or was not, to be attributed to the immigration of their parents in the early summer, may I state the following facts?

1. That there were, I am certain, no Edusas to be found on the downs near here at any time during the years 1890 and 1891.

2. That in June last I saw them here and there all over the downs.

3. That all the specimens seen by me appeared to be more or less worn. I caught several, and these certainly were all worn.

4. That Edusa is a very active, compact, and, may I say, muscular (?) insect, considering its expanse of wing, and will fly for many hours untiringly, day after day, and without showing any appreciable wear and tear.

5. That our summer migrant birds, soon after their arrival on our shores, spread rapidly over the country in all directions. (If Edusa migrates, why should it not do the same thing?)

6. That butterflies do without doubt migrate. I have myself witnessed the migration of tens of thousands of Cardui, and Darwin records that once when at sea he saw "clouds of Edusa," twelve miles from any land?

7. That this insect abounds over most parts of the continent, and, in view of statement 4, could easily reach this country from France in three or four hours.

8. That even a strong wind, unless it were a regular gale, would not, in all probability, much retard, and certainly would not altogether prevent, the immigration of Edusa, if and when the impulse seized it; for Miss Gordon Cumming, in "Two Happy Years in Ceylon," speaks of an annual migration there of "countless myriads" of butterflies, which, she says, "travel like an ever-flowing stream, *against the wind*, at the rate of about ten miles an hour."

9. That all the above statements may be applied to Cardui, except that this species was (here at any rate) less plentiful in the autumn—a very singular and, to me, inexplicable fact.

The migratory impulse seems this year to have acted simultaneously on Edusa, Hyale, Cardui, and the beautiful D. Pulchella—a remarkable fact, and one that presents a tough nut yet to be cracked by naturalists. The strange thing is the *spasmodic* and *apparently capricious* action of the migratory instinct in these insects.

R. B. POSTANS.

Eastbourne.

A FUNGUS GROWING ON TEREBENE SOAP.

By R. L. MADDOX, M.D., HON. FELL. R.M.S.

ON uncovering a bar of Terebene soap, which had been wrapped in paper and left on a shelf in the cellar for a couple of years, it was found to be closely covered on all sides with what looked like spots of soot, or light coal dust, to the naked eye, the spots being mostly circular and raised, ranging in diameter from the $\frac{1}{16}$th (one sixteenth) to the $\frac{1}{200}$th of an inch, or even less. Examination with a lens showed these spots to consist of a minute fungus, of which the following may be taken as a fair description when seen under the microscope, and after sectioning and mounting in a mixture of glycerine and potassic acetate.

As seen *in sitû*, the large and small black spots are found to be composed of a crowd of spores closely applied, and piled up on each other, the edges showing here and there free conidia, with adherent spores, projecting only a short way from the little mass, and with scarcely any hyphæ supporting them beyond a somewhat longish cell or two. Some of the conidia appear to have bent over, or to have other spores attached to them, forming a small irregular cluster.

The spores, both free, and those lying together, rest on a fine compact mycelium of a brownish colour, and vary both in size, contour, and colour. The shape being either oval or round, and the colour of a dark brownish olive green, there being also a few rather reddish brown in tint. The very fine spots look like a blackish dust to the naked eye, and consist of only a few spores, adherent and starting into growth. The mycelium threads, when they can be disentangled, consist of very fine thread-like tubes, with here and there specks of a granular plasm; some of the threads swell out into pale globular cells, and, apparently lying free, are rather large yellowish cells. Some of these are also attached to the end of the growing part, and are occasionally divided into two parts by two fine lines. Many of the old spots are exceedingly brittle, and under no method could I obtain a thin section; but, by keeping some thick shavings from the outside of the bar of soap in a closed gallipot, on well-moistened blotting paper, I was enabled, when the little mass was placed between cork, to get fairly thin sections. Two such have been figured. Fig. 10 is a transverse section of the top or crust of one of the compact circular spots; Fig. 11 is a vertical section. Lying were found free in the sections. One or two of the larger cells divided by two fine lines were also noticed.

An effort was made to grow the spores on various media, and succeeded best on the skin or peel of the ripe banana fruit; the peel being folded down at the

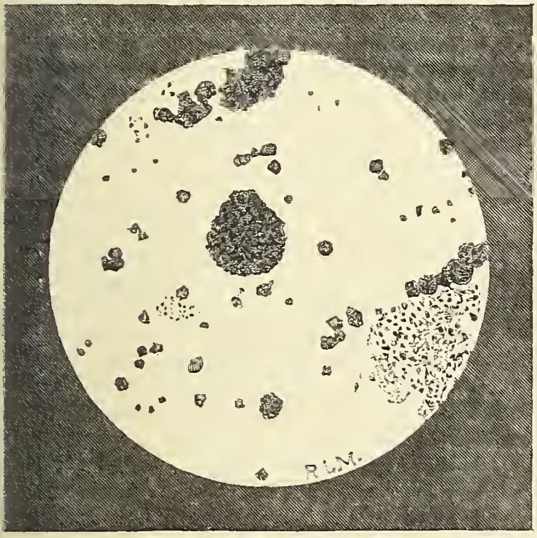


Fig. 9.—Fungus on Terebene Soap.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

free on the mycelium, or amongst the conidia, were often seen little masses of spores, just throwing out pale mycelium threads, or a few of the spores budding. Some were apparently not resting directly on the soap, so that, through deficiency of nutriment, the growth seemed impeded. Those spores that were lying *underneath* the general mass, and resting on the mycelium, were paler than the rest, and a few place where the spores were put, kept pressed together, and retained in a dark place at the ordinary temperature of the room. Fig. 13 represents such a culture at the end of seventy-two hours, and Fig. 12 a pale growth as found on the mycelium.

The fungus was grown also inside a pear and on table jelly as culture media. In the former it was more successful than on the latter.

An attempt was made to photograph some of the sections, but they were not entirely satisfactory; hence recourse was had to the camera lucida and colour for the figures. Fig. 9 represents a thick film of the soap, with the black spots adherent, as seen with a low-power objective, and magnified eight diameters; the other figures are magnified sufficiently to render the parts distinctly.

As I am not acquainted with a description of any similar growtb on soap, I venture to note tbe same, in the hope it may be of interest. Should it chance to be new, perhaps it may be, at least provisionally, named *Fuliginaria saponis*, from its soot-like naked-eye appearance, if the name have not been applied to any similar fungus. The soap has been manufactured over ten years, and in my possession for nearly the entire period. I am indebted to Professor F. Jeffrey Bell for substituting a fitter name, *Fuliginaria saponis*, than the one I had suggested.

THE CLOUDED YELLOW IN CORNWALL.

By Fred. H. Davey.

During the early part of August last, I called the attention of the naturalists of this county to the probability that we were about to have repeated the phenomenal appearance of this beautiful insect in 1877; and being myself fond of mnemonic aids, I further added, that if my surmise proved correct, astronomers and entomologists alike would have a convenient memory-peg, as both years would mark the opposition of Mars and the wide distribution of tbe clouded yellow. Singularly enough, my prophetic remarks proved more accurate than I anticipated, and within a few weeks from the publication of my letter in the "West Briton," I was receiving letters from observers, and mostly strangers, in all parts of the county, as well as from naturalists in the counties of Devon and Gloucester, reporting large numbers of *edusa*. Not in isolated specimens, or even in pairs, have they been seen, but abounding in amazing numbers, making tbc quaint old lanes and clover-sprinkled meadows of Cornwall, and Devon's sunny slopes, alive with beauty.

I made my first acquaintance with it last season on August 6th, while sauntering in the full blaze of a cloudless sky, along the north coast of this county. It was a singularly beautiful day, intensely hot and quite breatbless; a perfect one, in fact, for the movements of insect life. Tortoise-shells were out, painted ladies were gambolling about, skippers, and blues, and coppers were in plenty; and, above all, I saw three beautiful specimens of the clouded yellow—all males. The first crossed our path about midday, fluttered along a low hedge then ablaze with the roseate racemes of the ciliated heath, and then disappeared in a wilderness of clover beyond. Later in the afternoon, while strolling by myself, and enjoying a quiet smoke among the gigantic sand dunes which fringe that part of the coast, I suddenly popped upon two more, frollicking madly over a forest of ragwort which glamoured a large depression between the dunes. I was not prepared for entomological work that day, so tbere I lay, having a most enjoyable time in watching the tiresome flight of those two strangers. Twice they alighted among the clumps of ragwort stars, and though I could be on my oath about the very spot where they pitcbed, I failed to detect them on both occasions. The day following, my father saw another beautiful specimen, undoubtedly a male, at the lower portion of the Kennal Valley, and then, from that time onward to the first week in October, they became so common, that I could be certain of seeing a score on almost every day, while on exceptionally fine days they were almost the commonest forms of butterfly life which emblazoned our low-lying and sun-blessed meadows. Mr. H. Crowther, F.R.M.S., of the Royal Institution of Cornwall, was, I believe, the first to record it last summer, he having seen one specimen at the Lizard and another near Truro, as early as in June.

I have bright recollections of a few days when *edusa* was unusually plentiful. On the morning of September 20th, with just the tiniest breeze blowing from north-east, I lay on the trunk of a felled tree in a small clover-field down the valley, watching a great many of these swift fliers, gambolling with red admirals, peacocks, tortoise-shells, large, small, and green-veined whites. It was a sweltering day, and perhaps for that reason all kinds of butterflies were somewhat lazy in their movements. In the afternoon I took to the higher part of the valley, to a large field, bounded on two sides by densely-wooded slopes. The field was in corn, most of which lay on the ground in tortuous swaths, and the sun poured into it with full power, not the faintest zephyr being afloat. For a little over an hour I walked up and down the swaths, netting the objects of my search as fast as I liked. They simply swarmed in that ten-acre area, and without exerting myself in the least, I could take them at the rate of one in every two minutes. Among my spoils that afternoon, I had two females in an admirable condition. Two days later, with half a breeze from south by east, I saw large numbers disporting in a meadow bordering on the woods in the sheltered vale of Pengreep. A small rivulet ran along the lower side, making ragwort, hemp agrimony, flea-bane, and clover grow in rich patches. For two interesting hours I walked along this border, netting the beautiful specimens of *edusa*, which basked on tbe flower-heads in company with tbe painted lady, giving most of them their liberty after inspection. My object was first to see what comparison one sex bore to the other in point of number.

Without any approach to exaggeration, I think I may say, fully three hundred specimens of the clouded yellow were taken in my net last summer, of that number five only being females. I was struck by this disparity early in August, and with the idea of testing the point for the whole season I netted every possible specimen, subsequently granting liberty to those for which I had no purpose. My observations on the extreme scarcity of the female insect have likewise been established by the observations of many correspondents, who have sent me interesting particulars from all parts of the four western counties. This peculiarity cannot be accounted for by a tendency, on the part of the female, for resting, because I happen to have a good eye for insects, and it stands to reason that I could see the female resting, as readily as I could her lover.

There were just two other well-marked features in connection with the habits of *edusa*, which struck me, but which have received no notice from the writers in SCIENCE-GOSSIP, or from the many observers who have written to me. When netting in a clover-field, where the flowers were mostly white or of a whitish tendency, the clouded yellow invariably rested on bare patches of the soil, where it simulated the hue of its resting-place so admirably, as to give very sharp eyes a difficulty in detecting it. Where yellow flowers were prevalent, such as trifoliums and ragwort, it chose these for its resting-place, leaving the soil and white and pink flowers severely alone. And again, in meadows where the corn was stacked, and the soil was carpeted with a fresh after-growth, the stacks were the principal places of rest. So defined were these selections, and so nicely did they conform with the colours of the insect, that many desirable specimens basked before one's eyes in perfect bliss, enjoying immunity from capture. On September 20th, although I was positive about the place where I saw the insect alight, I missed a beautiful specimen of *Colias hyale*, Linn., the only one I saw for the season, on account of the conformity of its colour with the place where it alighted.

In addition to this choice of position when resting, the clouded yellow has shown a marked partiality for frequenting low-lying grounds, where it had full advantage of the sun, and was sheltered from all unkindly winds. Not twenty of all the specimens I saw last summer, occurred on the hill-sides or the breezy uplands. Absence or presence of food-plant will not account for this, for the whole country generally was ablaze with clover, during the months when the insect was prevalent; while many a brilliant clover-field with a breezy situation, proved a barren hunting-ground, during the time that *edusa* gladdened more sheltered positions. Hence I am inclined to think that, in spite of its strength of flight and endurance while on the wing, it is not a general lover of breezy situations.

Some time back my friend, Mr. Crowther, mentioned the fact, that while the clouded yellow was almost as common in Cornwall last summer as during the summer of 1877, the characteristic of the latter year had not been repeated, by the insect appearing in "flights." This is substantially true. For while the insect was seen in unusual numbers, no approach to the feature which made 1877 so famous to entomologists was noticed. I think its appearance in this valley was as striking as any records I have yet seen from other places; yet there was not the least indication on any occasion of the insect coming, gambolling, or going in flights.

ON THE UNDERGROUND GEOLOGY OF LONDON.

No. II.

By EDWARD A. MARTIN, Author of "Amidst Nature's Realms," etc.

THOSE borings with which we have already dealt in the previous paper on this subject, lay more or less in a direction north and south of one another. They are, however, by no means the only borings from which we are able to acquire useful information in respect to the contour of the underground foundations of the metropolitan area, and we now proceed to deal with those bore-holes which, starting with that at Burford, in Oxfordshire, lie in a line bearing a more or less N.W. and S.E. direction, and which, crossing London, terminates, in England, at Dover.

We commence at Burford, since here true coal-measures have undoubtedly been met with, and this fact gives us a fair starting-point, from which to judge of our palæozoic land-surface.

As in the diagrams which have already appeared, there is uniformity in the thickness and trend of the beds as far down as the base of the gault, after which speculation and theory have to take the place of ascertained fact. It will be noticed that there appears to be, to a certain extent, a thinning of the chalk as it approaches the surface on the north. This, however, is only apparent in consequence of the exaggerated vertical scale used, as compared with the horizontal scale, and would have no place were the scales identical. It is necessary that this should be borne in mind. We have seen that at Meux's in Tottenham Court Road, the appearance of 64 feet of Jurasssic beds, which lie immediately above Devonian strata, have to be accounted for. The Jurassic strata will here be met with as an approach towards the thinning out of these beds, which is gradually taking place as we proceed in a south-easterly direction, and which causes the appearance at Crossness of beds which remain undecided between Devonian and new red sandstone. In Fig. 14 they have been included amongst the former, although it is quite possible that they may be the latter, in which case there would be an at present

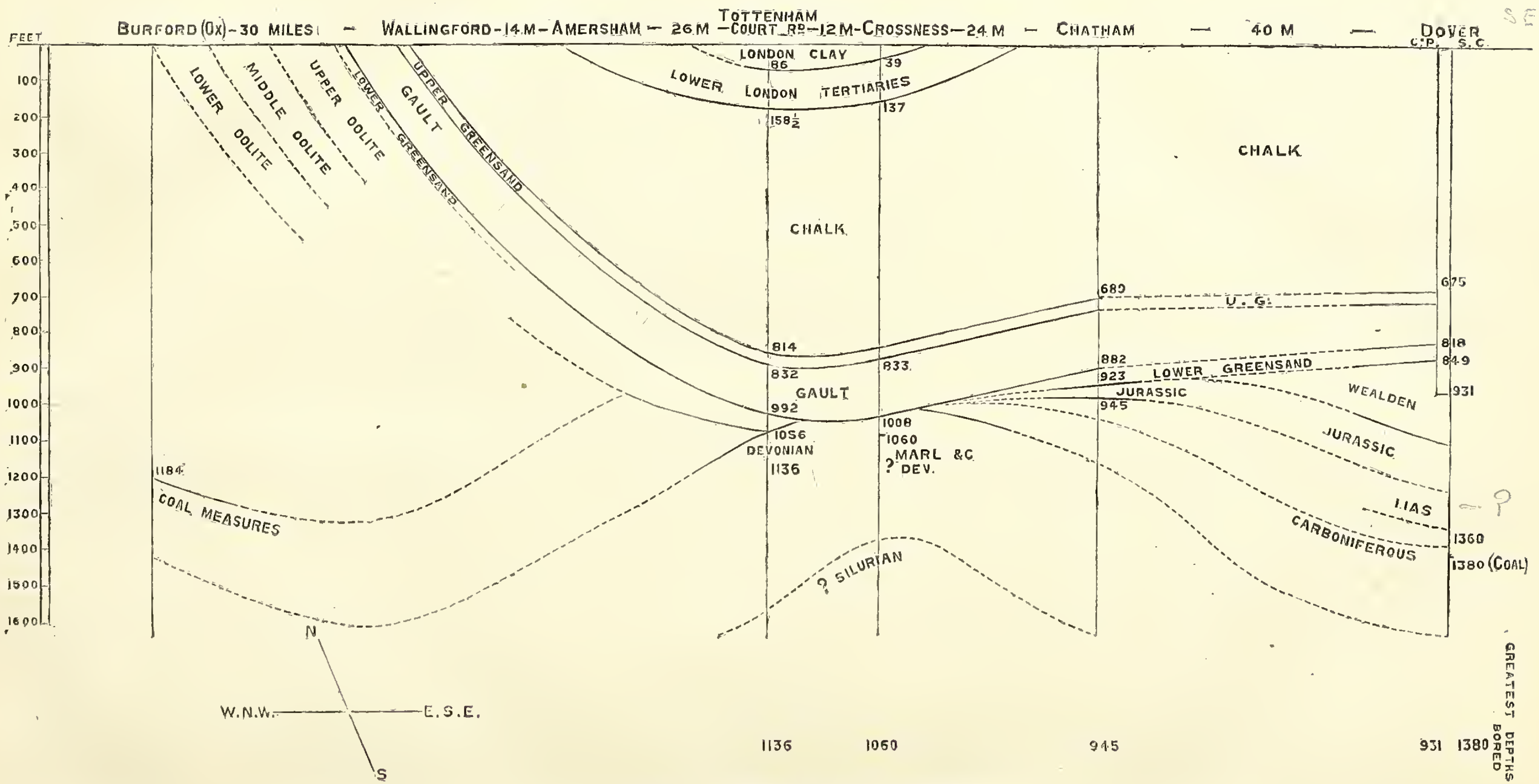


Fig. 14.—Diagram of the Underground Geology of London.

unknown trough to interpolate here, which would bring the roof of the Devonian to something below

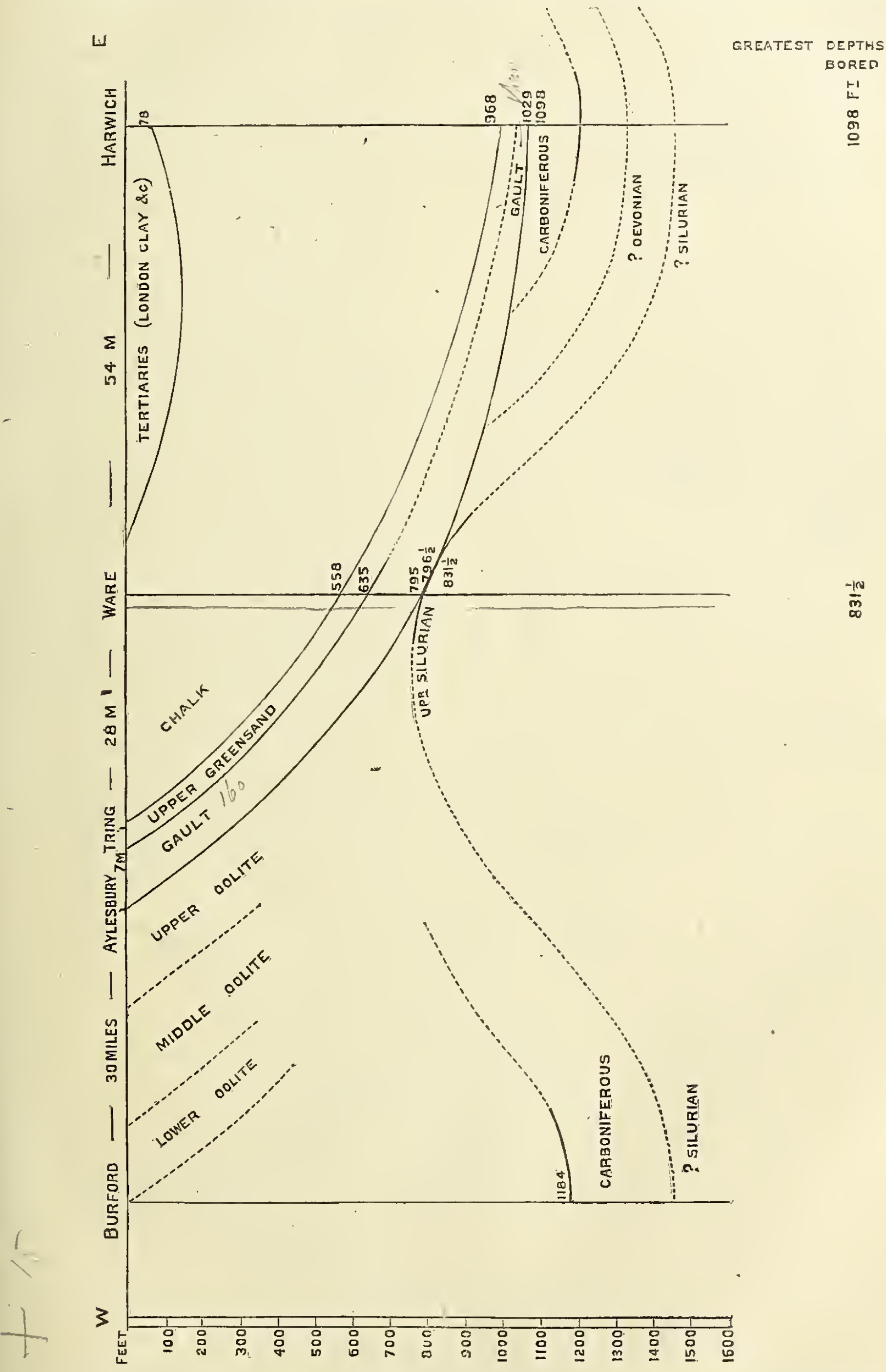


Fig. 15.—Another Diagram of ditto.

1060 feet, the greatest depth which was here bored, with perhaps just a patch of carboniferous above it.

When we arrive at the Chatham boring, we at once see that new strata have made their appearance, for here we find 41 feet of the tantalising lower greensand, besides 22 feet of Jurassic strata.

It is well-nigh impossible to form a plan which shall at all approach accuracy, in respect to the strata between Chatham and Dover. With the data at command, they might possibly have a direction such as shown in diagram; but the distance is too great to attempt to claim for the directions shown, that they represent the strata as they probably occur. There is this to be said, however, that the Coal Search Committee some time ago decided to continue the boring at Chatham, which at that time remained at 945 feet, and also to make a trial boring at Ashford, and there seems a great probability that in this way detached basins containing carboniferous beds may be reached. A great deal, however, seems to rest with chance and good fortune, since when the old surface is reached, possibly an intermediate outcrop of pre-carboniferous beds alone may be the result. Although I have shown bold lines as representing the trend of the various beds, they are probably divided throughout their whole lengths into isolated basins, although the general bearing may be such as is here shown.

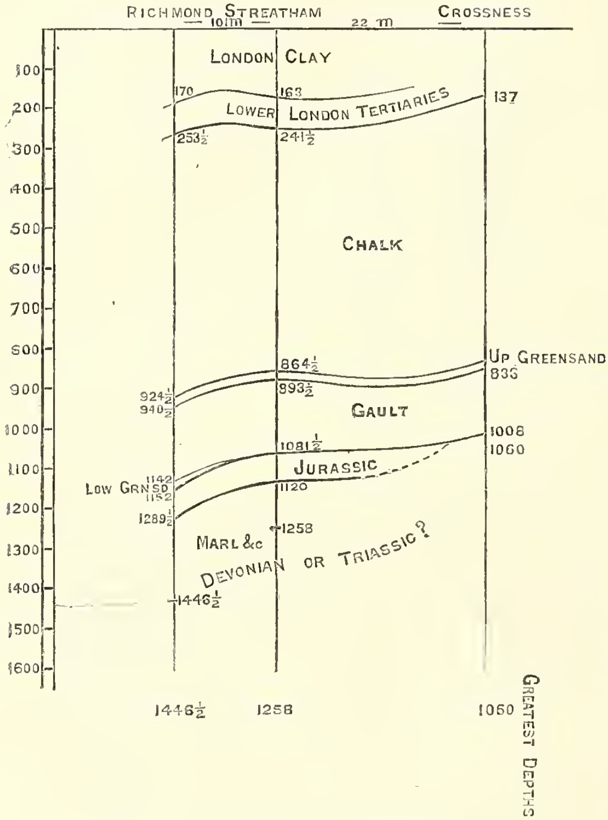


Fig. 16.—Vertical Scale of Underground Rocks.

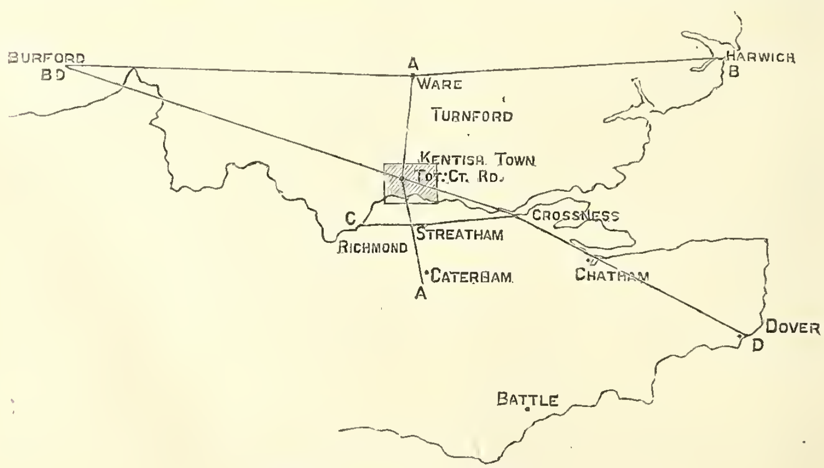


Fig. 17.—Sketch-Map of Trial-Bores.

At the surface, for the whole distance, we are of course upon the chalk, and this would appear to have throughout a fairly uniform thickness, as well as the lower cretaceous beds, but the succeeding deposits in these two borings differ from one another, and show that the Wealden beds, which have a known thickness at Dover of 82 feet, and probably considerably more, thin out between that town and Chatham, where the lower greensand rests immediately upon Jurassic rocks.

In the second boring at Dover, it will be noticed that I have shown the appearance of coal at a depth of 1380 feet, that is, at 200 feet deeper than the depth given in the reports of the discovery of coal at the Channel Tunnel Works. I have thought it advisable to do this, since all the other borings have been shown as being reckoned from one dead surface-level, the average level above the sea being about 200 feet, whilst the Shakespeare Cliff boring was commenced almost at sea-level.

In the skeleton map which accompanies this article, the lines of section which have been illustrated by the diagram have been shown.

Another section which should have our consideration is one which is represented only by three borings, viz., Burford, Ware, and Harwich. This section does not certainly pass through London, but as the question of underground London has the greater interest for many people, because the question of possible sub-London coal-beds is involved in it, it should not be omitted, since at Harwich a continua- of the palæozoic land-surface is shown in the appearance of undoubted coal-measures at 1029 feet. The curves in Fig. 15, may possibly represent the general direction of the strata, or the general rise and fall of a line connecting the numerous isolated old land-basins which probably formed the old surface.

A noteworthy feature in connection with the short section in Fig. 16, is that 10 feet of lower greensand rocks are reported from the Richmond Waterworks, and are spoken of by Mr. Whitaker in his work on the geology of the London area. Professor Judd was, however, understood to say at a lecture delivered in February last at Richmond, that the greensand wedge of rocks did not appear even so far north as Richmond, so that it would appear as though he were in doubt as to the identity of the 10 feet of rocks in question.

It cannot, however, be very far south of Richmond or Streatham where the wedge appears, and probably if ever the water-supply from the chalk fails the borough of Croydon, an ample supply would be obtained from the underground lower greensand, which would probably be successfully encountered there.

In concluding these sketches of what is known of the beds beneath London, I must acknowledge my indebtedness to Mr. Whitaker, F.G.S., who has kindly pointed out a slight mistake in my last article. In referring to the diagrams it will be seen that at Caterham I have placed supposed Jurassic beds immediately beneath the lower greensand. No doubt were the boring continued there below the present 814 feet, Wealden rocks would first of all be encountered, since the outcrop of these takes place at a very short distance southwards, viz., at Reigate. As this is, however, outside of the London boundary, it makes but little difference in connection with the purpose for which the diagrams were specially prepared.

It is understood that the geologists of the East Anglian counties hope shortly to be able to commence boring operations with a view to finding coal-measures, and considerable promises of support have been received. The results of boring here, together with those being carried on in Kent, should increase to an appreciable extent our knowledge of the deep-seated geology of the south and south-east of England.

NOTES ON THE CONCHOLOGICAL SOCIETY'S NEW LIST OF BRITISH MOLLUSCA.

By T. D. A. Cockerell.

THE Conchological Society's new list, which had for some time been expected to appear, was duly published in the "Journal of Conchology" for April (issued June 3rd), and is no doubt by this time in the possession of nearly every British collector or student of mollusca.

A critical list like this is a very different matter from my "British Naturalist" Catalogue, which aimed simply at giving *all* the recorded forms, except absolute synonyms. The authors of the new list have gone over the whole series of published names, changing or dropping them whenever they thought advisable, and adding some from their own knowledge. The result is sufficiently remarkable, for although only thirty-eight varieties are added to those listed in the "British Naturalist" Catalogue, over three hundred and fifty names which have been applied to varieties or mutations of British land and fresh-water mollusca, are excluded! Among these are several which were earlier named, or introduced as British, by the authors of the list.

Messrs. Taylor, Roebuck, and Nelson have studied the British Mollusca so closely for many years, that probably nobody will question the value of a list compiled by them; and if many are found who disagree with some of its features, it is only because of the wide divergences of opinion which exist, rendering it impossible to produce a list that will suit everybody.

For my own part, I totally disagree with the authors on the subject of varietal nomenclature, believing that a very careful examination of all forms of variation throughout the country is desirable, and that for facility in recording and comparing records, we must have names. Without elaborate research of this kind, I do not believe we shall succeed in solving in a satisfactory manner such problems as present themselves, e.g. those relating to the influence of environment, or to the divergence from the continental type exhibited in these islands. As Darwin observed, "I look at individual differences, though of small interest to the systematist, as of the highest importance for us, as being the first steps towards such slight varieties as are barely thought worth recording in works on natural history. And I look at varieties which are in any degree more distinct and permanent, as steps towards more strongly marked and permanent varieties; and at the latter, as leading to sub-species, and then to species." ("Origin of Species," p. 41.) The deviations from the typical form in any variable species may be classed under three heads, as follows:

(1.) *Modifications due to the direct result of environment.*

These are believed by many to be never inherited; and it is a matter of common experience that many of them are not, at all events visibly, in the immediate offspring. Some forms of this sort which have received names are, as the authors of the list say, "mutilated shells which have repaired the injuries sustained from adverse surroundings," and it is perhaps questionable whether such should be named. The double-mouthed condition of *Clausilia* is a case in point.

Yet the matter is by no means so simple as at first appears. An ordinary decollated monstrosity comes exactly under the above definition of "mutilated shells which have repaired" etc., against the naming of which the authors of the list so strongly protest; but on turning to the list itself we find several decollated forms included, two of which were named by Mr. Nelson, one of the authors! This is well, for we know that decollation, though of the character alluded to in the monstrosities of the list, may become a permanent *specific* feature, as in *Stenogyra decollata*. The fact is, that it is extremely difficult to accurately measure the influence of environment as against inherent variability, even in "monstrosities." Thus, the frequency of fracture might well be in part affected by the texture of the shell, which varies, the variations being inherited. Size may be affected by the external cause of want or abundance of food, but there can be little doubt that the power of assimilation is also a very important factor, and this is subject to ordinary variability. It is probably selection more than excessive nourishment, that has so increased the size of many cultivated plants and domesticated animals. We see this in the invariable increase of the part selected, instead of a general enlargement of all the parts.

(2.) *Modifications due to inherent variability, and more or less intermittently inherited.*

These are deviations from the average, occurring in the same brood as the normal form, and known as "forms," or "mutations." The vast majority of names excluded from the new list belong to variations of this character, as also do very many retained in it. It is about these that the essential difference of opinion may be said to exist, for I believe that the great majority of conchologists would agree as to the desirability of naming geographical races, which occur independently of the type.

Albinos, sinistral variations (which, as it seems to me, are quite wrongly called monstrosities), and the ordinary colour and band-variations of Helices, may be classed as mutations; which, however, under the influence of selection, are ever ready to become racial or specific in character. It is from these mutations that species are made; they are, so to speak, the raw materials for the making of species. *Hyalinia crystallina* is an albino species; several species of *Pupa* and *Vertigo* are normally sinistral; and hundreds of other instances might be given, in which the mutation characters of one species are the normal ones of another. To study only the finished article, the well-marked race or species, is I believe a radical mistake; to learn about the origin of species we must examine the materials out of which species arise. Furthermore, let it not be supposed that the range of a mutation is usually the same as that of the species. A species may have four mutations, A. B. C. D., and yet very likely the whole four will only be found in a few places (perhaps not anywhere) together; most localities will produce only A. B. C., or A. D. B. or C. D., and so forth. *Helix nemoralis* has some hundreds of colour and band-variations, most of which are more or less common, yet probably there are scarcely two counties in England which, if thoroughly explored, would produce the same variations exactly, and perhaps hardly any two parishes would give the same percentage of each. This sounds astonishing, but I believe experienced collectors will agree with me that this is likely to be the case. It has certainly been so in my own experience.

It is only by the careful study of mutations that we can establish these facts, which are, I believe, of great importance in evolution. Thus, supposing a new form of selection is brought to bear, such as a change of climate, or the introduction of a new enemy, it is easy to see how greatly the power to produce such mutations as can survive will benefit the species, and consequently, since this power is variable, we may have survival in one part, and extinction in another part, of its range.

(*To be continued.*)

SCIENCE-GOSSIP.

We have received from Mr. F. Row, Braintree, a packet of "Adhesive Corners," invented and registered by himself. The design is an admirable one, especially adapted for use by solicitors. literary men, in public offices, museums, etc.

Another good man has recently joined the majority. Mr. T. J. Moore, Associate of the Linnean Society, and Corresponding Member of the Zoological Society of London. For forty years he was Curator of the Liverpool Museum; and it was he who worked it up to its high pitch of zoological excellence. This he did by enlisting the services of all the sea-captains in Liverpool. Mr. Moore also was one of the first curators of museums who delivered popular scientific lectures in illustration of their contents.

One of our most distinguished practical, as well as theoretical electricians, is Professor Preece, F.R.S., who has been recently appointed chief engineer and chief electrician to our General Post Office. For many years past the special department of electrical communication he has worked at, has been that of induction. Naturally we should expect that a brilliant electrician of Mr. Preece's fame, so largely controlling the commercial correspondence of the great British Empire, would turn his attention to any great electrical interferences with the wires. Every telegraph boy is aware that at every country post-office, where a sixpenny telegram occasionally comes, when there is a violent thunderstorm they cannot telegraph. This is due to the more powerful induction, overcoming the weakly generation of artificial batteries, by the fearfully more intense batteries of the world outside.

HITHERTO we have trusted for our electric communications to our wires, but Professor Preece, aware that induction often overcame conduction, has for three years past been experimenting along various parts of the British coast, with a view to seeing whether communications proceeding along chief main telegraph wires, could not be inductively flashed to, and understood by, the lightships moored along the coast, without the intervention of a wire. In other words, the future history of telegraphy will not be along wires, but from wire to wire.

PROBABLY Dr. Preece's discovery, which cannot fail to be considered and taken up in every part of the civilised world, is one of the most eventful epochs in telegraphic communication, and there is no question whatever, that within the next twelve months we shall hear more and learn more concerning it. It is a singular fact, that although many commercial people apparently appear not to have too much direct communication with each other, they all seem as if they would like to wire one to the other if necessity requires it.

AN English king is said to have died from eating too many lampreys. This eel-like fish is one of the lowest organised, zoologically speaking, of the fish family, and as an object of food is now seldom sought after, if ever partaken of. It has a large geographical distribution, there being few tidal rivers in the world up whose waters it does not migrate. To a philosophical naturalist, extensive geographical distribution suggests that the animals widely distributed must have had an ancient ancestry, inasmuch as many physical changes on the surface of the earth are required to distribute animals and plants. As a matter of fact, it is taken for granted that any group of living beings now found removed from each other in different parts of the globe, must have been thus transferred from point to point, during those geological periods which demanded such a vast amount of time. Indeed, this idea is now so largely accepted that a widely-distributed organism is expected to have a geological ancestry, even if nothing representing it has been found as a fossil. There is an illustration in point concerning the lampreys. At a recent meeting of the Linnæan Society, Mr. A. Smith Woodward exhibited some specimens of fossil lampreys from the old red sandstone of Caithness, in Scotland (that wonderful storehouse of primeval fossil fishes, which poor Hugh Miller was the first to make known to the world). Fossil lampreys had not previously been known to occur in formations older than the tertiary period.

PROFESSOR LEBOUR, of Newcastle-on-Tyne, has just made a most important communication and explanation, equally interesting to astronomers and geologists, concerning the so-called "canals" of the planet Mars. It is many years since the distinguished Italian astronomer, Schiaparelli, announced the discovery of a so-called "canal system" upon the surface of our neighbour planet. Since then this idea has caught on to such an extent, that when Mars approached nearer the earth during last summer than it has been for years past, or will be for years to come, some foolish people, inoculated with a Jules Verne kind of idea, who took it for granted that the canals were the construction of some sort of intelligences equivalent to human beings, thought it would be a good thing if we could telegraph from our earthly planet to our supposed neighbours in their martial world, and inquire of them in some sort of scientific way, who they were, and how they were getting on.

LET us draw attention to the fact that the worlds (suns, stars, moons, etc.) were not all made at once. When we were lads, studying science on our own account, people who were astronomically inclined thought that suns, moons, and planets were all inhabited by intelligent beings. Indeed, in dear old Dr. Dick's "Christian Philosopher" (one of the most infectious books ever remembered) was the evangelical idea, that the souls of the saved would ascend from planet to planet to the uttermost verge of the solar system—say the planet Neptune. Milton had a similar notion in his "Paradise Lost," only less definitely expressed. Dante constructed his plot in this wise—that, instead of having seven planets for the saints to ascend to, he had seven hells for the lost to descend to. Perhaps both were right—at least, in their own opinions.

SOME of our readers may ask what this has got to do with the "canals" of Mars. Simply there are no inhabitants on the surface of the planet Mars, or the odds are that they are not intelligent. What are these Schiaparelli "canals"? It can only be replied to by geologists familiar with the fact that all worlds are not of the same age or size. Some cooled down at one time, some at another, and some are not cooled yet. Supposing all the planets of the solar system had been composed of highly-heated glass, some very big and others very little indeed, down to the littlest of sizes, it is evident their external physical appearances would be vastly different; as they cool some would crack from north pole to south, or perhaps contrary or diagonally-wise. Practically, this has been demonstrated to be the case by an eminent French scientist, Professor Daubree, whose glass-breaking experiments proved that their fractures were due to the strain or torsion of cooling alone. Professor Lebour suggests that the Schiaparellian "canals" of the planet Mars may be due to similar cracks and fissures on the surface of a cooling, but heated globe, and that possibly more than the hundred millions of years ago, to which Sir Alexander Ramsay assigned the smallest limit of the life of our globe—indeed, before life began at all—our own little planet the earth, was probably scamed with "canals" similar to those represented by the present pre-geological stage of the planet Mars.

In the last number of the "American Naturalist," there appears a paper by Dr. H. W. Conn on "Some Uses of Bacteria." These organisms are in the position of the dog which got a bad name. People think of them as so many microscopic foes, whereas, generally speaking, many of them are our best friends. Every farmer expects that he will have to keep a good breed of horses and stock, but few of them are aware how they require a good breed of bacteria as well! Indeed, no farmer can get on at all, unless he keeps a good stock of bacteria on his farm. He is aware, of course, that he cannot make butter and cheese without cows; but until recently he did not know that even if he possessed the finest herd of kine, he would not be able to manufacture these articles of food without bacteria. Tillage, whether in the garden or the field, would be absolutely and uselessly thrown away without their aid, for it is they which render all sorts of nitrogenic manures available. Bacteria are amongst the most lowly forms of plant life, very nearly allied to the microscopic yeast and fungi. It is more than probable that we owe more to these microscopical members of the vegetable kingdom, than to its larger and more advanced species.

Through inadvertency "The Conchologist" (edited by Mr. W. E. Collinge, one of the most indefatigable and promising of the young school of biologists) has not been entered among our Books, etc., received. This is unfortunate, as the "Conchologist," is one of the best of our natural history magazines.

Our correspondent, the Rev. Hilderic Friend, F.L.S., of Idle, Bradford, writes to the effect that he has discovered two more species of Oligochæta, new to science. The first is a fresh-water worm (*Dichæta curvisetosa*, Friend) taken from a well in Chelmsford, Essex. It will be described shortly in the scientific journals. The other is an earthworm from Dublin (*Lumbricus papillosus*, Friend), which was first found in June last, but was not described for want of sufficient material. It fills a gap in the European list of Lumbrici, and is a worm of unusual interest. Another Irish worm (*Allo. hibernica*, Friend) has recently been described in Dublin.

At the last meeting of the Institute of Marine Engineers, Mr. J. Alfred Fisher read an important paper, on "The Mining, Manufacture, and Uses of Asbestos."

We have received a copy of Dr. T. B. Franklin Emerson's pamphlet, entitled "Epidemic Pneumonia at Scotter," tracing its history, causes, and pointing out means for future prevention. It is a carefully and originally worked out and thought out paper.

"Observations on Dew and Frost" is the title of a brochure by the Hon. R. Russell, F.R.Met.Soc., published by Ed. Stanford. It details the careful results of a long series of experiments, of practical meteorological value.

We gladly call attention to a pamphlet by "Free Lance," published by Williams & Norgate, entitled, "The Cry of the Children." It is practically an essay on the tyranny and ignorance of those to whom the care of children is entrusted, based largely on Herbert Spencer's teachings. It is a smartly written, almost cynically written contribution to the literature of modern education. All educationalists (to say nothing of parents) ought to read it.

We have much pleasure in drawing special attention to the last issue of Messrs. Dulau's "Catalogue of works on Chemistry and Physics;" also to Messrs. Pickering & Chatto's always welcome "Book-Lover's Leaflet." From Mr. Felix L. Davies, Berlin, we have received No. 20 of his catalogue, "Bibliotheca Entomologica."

The last number of the "Essex Naturalist" contains a capital paper by Mr. Walter Crouch, entitled "Dagenham Beach." It is chiefly historic and antiquarian.

Number 2, of volume v. of "Insect Life" (the periodical Bulletin, issued monthly by the V.S. Department of Agriculture), devoted to the economy and life-habits of insects, especially in their relation to agriculture, edited by C. V. Riley, Esq., is to hand.

We are sorry to announce the death of Dr. W. Siemens, the distinguished electrician, brother to Sir W. Siemens, at the advanced age of seventy-six.

Mr. W. J. L. Abbott contributed to the last number of the "Proceedings of the Geologists'

Association" a paper on the occurrence of the Walrus in the gravels of the Thames Valley, at a depth of 33 feet.

THE Anniversary Dinner of the Royal Society was held on the evening of St. Andrew's Day, under the presidency of Lord Kelvin.

THE following are the Lecture Arrangements at the Royal Institution before Easter:—Sir Robert Stawell Ball, Six Lectures (adapted to a juvenile auditory) on Astronomy; Professor Victor Horsley, Ten Lectures on the Brain; the Rev. Canon Ainger, Three Lectures on Tennyson; Professor Patrick Geddes, Four Lectures on the Factors of Organic Evolution; the Rev. Augustus Jessopp, Three Lectures on the Great Revival—a Study in Mediæval History; Professor C. Hubert H. Parry, Four Lectures on Expression and Design in Musie (with musical illustrations); the Right Hon. Lord Rayleigh, Six Lectures on Sound and Vibrations. The Friday Evening Meetings will begin on January 20th, when a Discourse will be given by Professor Dewar on Liquid Atmospheric Air.

"TRANSACTIONS OF THE HERTFORDSHIRE NATURAL HISTORY SOCIETY AND FIELD-CLUB."—The journal of this Society contains in its numbers from June to October, 1892, among other articles, the following:—"Bats and some other Beasts," by George Rooper, F.Z.S.; "Terrestrial British Quadrupeds existing in the wild state at the Present Day," by T. Vaughan Roberts; "Notes on Birds observed in Hertfordshire during 1891," by Henry Lewis; "Our Food-Fishes, their Friends and Foes," by F. E. Beddard, M.A., F.Z.S.; "Amongst wild Beasts," by A. Stradling, C.M.Z.S.; also various accounts of Field Meetings, additions to library, Balance Sheet, and Report of Councils.

THE planet Jupiter obtains the greatest amount of attention from astronomers in all parts of the world. Its enormous size commands astronomical respect, and it illustrates the history of planetary evolution more effectively than any other member of the solar system. It exists in a stage through which our own earth passed hundreds of millions of years ago. This is shown by the fact that although Jupiter is 1300 times larger than the world we live on, it is only 310 times heavier. Jupiter is in the pre-vital planetary stage of evolution. That part we see through the telescope is only the reflection of the external atmosphere which surrounds, perhaps, a white-hot, and certainly a red-hot, planet. It is highly probable the lower part of Jupiter's atmosphere is in a state of incandescence. Only the elasticity imparted by enormous heat could allow the body of the planet to sustain and resist the downward pressure of the vast ocean of vapours and gases above. Such an atmosphere, even if it had a depth of only sixty miles, would press on the surface of Jupiter with a weight many times that of platinum, unless counteracted by a very high temperature. The now famous great "red spot," first observed twelve years ago, and which was formerly regarded as a glimpse of the solid body of Jupiter seen through its rent atmosphere, turns out to be a visible patch of the lower strata of the atmosphere itself. It is constantly shifting about, as are also other great patches visible upon the surface of the same mighty planet. The actual surface of the "great red spot" visible on Jupiter is larger than that of the whole surface of our own globe.

FROM all of these facts, which are increasing in number every day, we may gather some knowledge of the restless physical activity of the body and atmosphere of this wonderful planet. It reminds a geologist vividly of the physical conditions through which our own world passed when, ages ago, before life began upon its surface, it was in a state of primitive development. At that time our earth was enormously larger than it is now, its volume possibly extending beyond the present orbit of the moon. By subsequent cooling and condensation it became the world pretty much as we now find it. After vast ages yet to come, Jupiter also will cool down until, instead of 1300 times larger than the earth, it will only be about 310. Those of our readers who wish to follow up this interesting subject should forthwith procure a nicely got up pamphlet, entitled "Jupiter and his System," written by a well-known lady, Miss Ellen M. Clerke, and published by Edward Stanford, Charing-Cross, at 1*s*.

CURIOUS facts and curious inferences are constantly cropping up. Here is an example which seems to have something in it; and blue-eyed people, of which England possesses so many, will not only be interested in the statement, but will not deny it. It is to the effect that nearly all the greatest men of the world, in all ages, have had blue eyes. Amongst them are enumerated Socrates, Shakespeare, John Locke (the great metaphysician), Lord Bacon, John Milton, Goethe, Benjamin Pranklin, Napoleon the Great, the lately deceased great French historian Renan, Bismarck, Mr. Gladstone, Professor Huxley, Professor Virchow, and others. It is stated that, singularly enough, all the Presidents of the United States except General Harrison have had blue eyes. After this it will not be surprising if people try to change the colour of their eyes as they do that of their hair.

DOUBTLESS most readers have heard something about the comet discovered by Mr. E. Holmes some weeks ago, and which can be seen in the constellation Andromeda. Mr. Holmes gave a capital account of it in a recent "Graphic," which we should advise our readers carefully to study. Stellar-photography recorded it as far back as the 18th October last. The nucleus, or most solid portion of this comet, seems to have shifted from the centre towards the front end. Thanks to photography and spectrum analysis, the comet Holmes will very likely afford the world a better knowledge of comets in general than any of its predecessors.

MICROSCOPY.

"CHAMPIGNONS DE FRANCE."—Under this title, Messrs. J. Tempère & E. Dutertre, of Paris, are issuing a series of admirably mounted slides, of sections, as well as entire specimens of the minuter fungi. We have just received the first dozen, and can therefore testify to their neatness and usefulness. A student of microscopic fungi can now travel on a royal road to knowledge. The sections of most plants, with their parasitic fungi, are marvels of modern mounting. These slides are accompanied by four fascicules, or parts of explanatory text. They are well and clearly printed, and each species is carefully synonymised, its habits and habitats described, as well as a carefully and plainly detailed diagnosis of its structure,' appearance, etc.: these fascicules are published in French.

NEW SLIDES.—We have received from Mr. Ernest Hinton, 12, Vorley Road, Upper Holloway, two beautifully mounted and highly instructive objects. One is the well-known hydroid *Eudendrium ramasum*, with the tentacles fully expanded, an exquisite thing with the paraboloid. The other is the stigma of the narrow-leaved perennial oat-grass (*Avena pratensis*). The stigma has the filaments and stamens attached to it. The stamens are shown filled with pollen.

ZOOLOGY.

BLACK-VEINED WHITE BUTTERFLY.—A correspondent asked in SCIENCE-GOSSIP, for December 1891, for records of instances where this insect has been taken in this country during the past twenty years. During May of last year a friend of mine who possesses a keen eye for all kinds of strange things, sent me a butterfly, in a somewhat battered condition, which he took on the outskirts of this valley, and which I had no difficulty in identifying as the black-veined white. It was one of about a score which the observer saw hovering along a narrow lane. Being struck by the marked difference they bore to the common whites, he gave chase, but having nothing better than his hat to take them in, and being somewhat stiffened by the wear of sixty-five summers, the specimen which he secured was in a very dilapidated condition, and altogether unworthy of a place in the cabinet. A few weeks back I was talking with an enthusiastic young entomologist on the subject, and was agreeably surprised to find she had secured a fairly good specimen of the same insect of this neighbourhood in 1891.—*Geo. H. Davey, Pousanooth, Perranwell Station, Cornwall.*

THE LATE W. MATTIEU WILLIAMS.—It is with the utmost regret we have to record the sudden death of our old friend and delightful correspondent at Neasden on Monday, November 28th. All our old readers will remember his monthly papers on contemporary science. Mr. Williams wrote several important scientific books, such as "The Fuel of the Sun,' "Chemistry of Cooking," etc. One of his earliest and most delightful books in reality opened the country described, "Through Norway with a Knapsack." Mr. Williams was a man of an enormous range of reading, a good chemist, geologist, and naturalist, and a good hater of scientific priggism.

THE RUDDY SHELDRAKE.—The Ruddy Sheldrake (*Tadorna casarca*) has occurred in some number on several of our coasts this year, and many ornithologists are interested in this bird. Its first appearance in Norfolk was recorded in SCIENCE-GOSSIP for 1869, by Thomas Southwell, Esq. F.Z.S., who says it occurred on the 26th of March, when a male was "killed" on the beach at Snettisham by Mr. Wright, but further on in the volume Dr. L. positively informs us "the bird alluded to in our last was a veritable 'escape.'" Be this as it may, Mr. G. Smith of Yarmouth writes me that a young "Ruddy" was washed ashore at Snettisham on the 13th of last September, and evidently looks upon this as the first certain record of the bird having been taken in Norfolk. I will not quote from F. Menteith Ogilvie, Esq., M.A., F.Z.S., who writes a very interesting paper on the subject in the "Zoologist" for November of this year. I have tried to get information from gentlemen residing in various parts of the country, but with poor result. Mr. H. W. Marsden states that one was taken or seen in Hereford, which was probably an "escape," and adds that a specimen from near Gloucester once came into his possession. The London Naturalists seem to have nothing to say on the subject. Another specimen of the Ruddy Sheldrake was undoubtedly shot near Ipswich the end of last March, probably on the river Orwell, as it was seen in the flesh by Dr. Taylor, who states it was offered for sale to him, and at the time was dripping from the beak; it has since been lost sight of, and all attempts to discover its present whereabouts have failed. Mr. Kerry of Harwich says he neither saw nor heard of such a bird being taken in the district. I would be much obliged if readers of SCIENCE-GOSSIP, throughout the country would kindly communicate with me viâ Dr. Taylor's admirable journal, if they have seen or heard of specimens of this rare and almost extinct bird during the past year. Readers dwelling in and about Ipswich are invited to view the specimen, a female in a very fine state of preservation, in the Ipswich Museum.—*C. Morley.*

EARTHWORMS.—It may interest some of your readers to know that among a consignment of earthworms I collected last November, at Beechwood, near Malahide, Co. Dublin, and sent to the Rev. Hilderic Friend, F.L.S., to be identified, there were five worms new to Ireland and one to science. Mr. Friend has very kindly sent me the following list:—*Lumbricus terrestris*, L.; *L. rubellus*, Hoffm.; *L. purpureus*. Eisen; *Allolobophora longa*, Ade; *A. trapezoidea*, Duges, new to the Irish list; *A. chlorotica*, Savigny; *A. muscosa*, Eisen, new to the Irish list; *A. turgida*, Eisen; *A. subrubicunda*, Eisen, new to the Irish list; *Dendrobæna Eiseni*, Levinsen, new to the Irish list; *D. arborea*, Eisen, new to the Irish list; *D. rosea*, Friend, the new worm, first found here, subsequently in Gloucestershire; *Allurus tetrædrus*, Savigny; *A. tetragonurus*, Friend.—*J. Trumbull.*

BOTANY.

PRESERVATION OF COLOURS IN DRIED FLOWERS.—In reply to the query of I. G. in your December issue, as to the better preservation of the colour of certain Campanulas accidentally pressed between fly-leaf and cover of book, I fancy the cause lies, not in the colour, but the glossiness of the paper, which would cause it to be non-absorbent, as I find from experience that plants dried between highly glazed paper lose their colours much less than when dried in the orthodox fashion.—*J. L.*

CASUAL AND ALIEN PLANTS.—Under the above heading an interesting notice appears in the December number of SCIENCE-GOSSIP. It is very curious to note the way in which these plants appear in a neighbourhood, and sometimes establish themselves without its being possible to trace the manner in which they came. For instance I have found *Amoracia rusticana* in all sorts of odd spots, sometimes a very long way from paths or houses. Last year I discovered a single plant of *Lepidium ruderale* close to a small foot-way almost in the heart of Leicester, and on looking again this season I found some forty or fifty specimens. This is, if I am not mistaken, usually a sea-side flower, and so far as I could make out there had been no soil moved to or from the place where it was growing for a long while, nor do I know any other reason which would account for its presence. I also found it in July between the metals on the G.E.R. near Bramford, but there, of course, it might have been carried with ballast. *Hesperis matronalis* is sometimes found, generally escaped from a garden not far off. *Linum usitatissimum* I have seen in an open drive through a wood, and in many other places, but even though flax be not cultivated in the neighbourhood, there are several ways in which it might have occurred. *Melilotus alba* suddenly appeared one year in a brick-yard near Kibworth, in Leicestershire, but was not permanent. My father, Captain Howard, observed and gathered a Potentilla, I think *P. hirta*, on the mud which had been taken out of the river Gipping, between Ipswich and Claydon, and which had been left beside the towing-path. While living at Wherstead, in Suffolk, I once brought some specimens of *Sedum Anglicum* from near Felixstowe, and having kept some, threw the others away. The next year the tiles on one side of a shed near-by bore many specimens of this plant, but I do not know if it is still in existence there. At Saddington Reservoir in Leicestershire, some years ago, one or two plants of *Œnanthe phellandrium* made their appearance. The water-keeper was one day going to pull them up, but a gentleman who was boating, persuaded him to leave them. The water now is full of *Œ. phellandrium*. *Vinca major* is well established in many places, particularly round old shrubberies. *Hyoscyamus niger* seems to turn up in a very uncertain fashion, several specimens being found in a parish one year, then disappearing, and perhaps reappearing after some years. I have known several instances of this. In an old gravel-pit near Smeeton, in Leicestershire, I dropped on to *Orobanche elatior*. It seemed to have been there some considerable time, but I know no other spot in the country where it grows. I gathered at Felixstowe, some years ago, a single shoot of *Asparagus officinalis*, but I never found any more there. It used, however, to grow abundantly on the banks of the Orwell, some miles away, but I believe, is now destroyed by a sewage outfall. This list might be multiplied considerably by including such plants as *Saponaria officinalis*, which is growing in great abundance by the roadside at Bramford and one or two neighbouring villages, but which is evidently a stray from the cottage gardens hard by. I may mention, however, that a *Claytonia*, which I think is *C. siberica*, was forwarded to me from near Buxton, where it was flourishing, to all appearance wild. Many of the examples quoted above may have been carried by birds, by the wind, or by streams, but for some I can think of no probable means of transportation. In the Rev. F. B. Zincke's book, entitled "Wherstead," the author mentions, that on cleaning out the mud from a pond in Wherstead Park where no water-cress grew, a great number of young plants of *N. officinale* quickly sprang into life on the half-dried heaps of soil. Would this fact account for any of the occurrences of these casual or alien plants?—*Lawrence Creaghe-Haward.*

Coloration in Plants.—The remarks of I. G. reminded me of a curious fact I noticed in connection with some sprays of blossom from the everlasting pea. They were early blossoms, of a gorgeous crimson colour, and were used a good deal for table decoration. When the cut flowers had been in water a day or two, instead of drooping and falling, the stems remained erect, but the highly coloured flowers gradually changed in colour to a pale chalk-blue, to much the same tint, in fact, as that of the harebell. Nor was the colour one which gave the impression as of a fading flower; it was as though the adopted colour was the natural and original one. The change was noticed on some few occasions. Blossoms taken later in the year did not, however, change so well.—*Edward A. Martin.*

Some Stray Plants in North London.—Building is constantly in progress in suburban London, and it often happens that when a large estate is laid out for this purpose, only a small part is built on at first, and the rest of the ground is left waste, often for several years. As this neighbourhood is hilly, it is often necessary to level the ground before building. Whenever this is done, and the new surface left to itself for any time, it is curious and interesting to watch the plants that first take possession, together with the common weeds. The following plants have been noticed in such situations (with three exceptions noted below): *Erysimum cheiranthoides*, L., East Finchley and Crouch End; *E. orientale*, Br., Crouch End; *Brassica tenuifolia*, Bois., East Finchley and Brickfield at Hampstead; *Camelina sativa*, Crantz, Muswell Hill and Crouch End; *Thlaspi arvense*, L., and *Lepidium ruderale*, L., Crouch End; *Dianthus armeria*, L., found once in a wood at East Finchley, apparently indigenous; *Saponaria vaccaria*, Crouch End; *Impatiens parviflora*, Hampstead, probably brought with greenhouse refuse; *Melilotus officinalis*, L., and *M. alba*, Lam., Crouch End; *Potentilla argentea*, L., roadside, Highgate; *Carum carvi*, L., Crouch End; *Centaurea cyanus*, L., several localities; *Chenopodium polyspermum*, L., and *Rumex maritima*, L., Crouch End; *Panicum viride*, L., Muswell Hill; *Phalaris canariensis*, L., several localities. None of the above are commonly found about here, and none have gained a permanent footing. They have appeared for two or three years, and have then been choked out by the common weeds. Where did the seeds of these plants come from, and how were they brought? It is not easy to say, unless, indeed, they were brought with some of the building materials that were used near. The soil here is chiefly stiff London clay.—*J. E. Cooper.*

Coloration of Flowers.—Let I. G. (page 281, Dec. number) rest assured that the colouring-matters of the harebell and that of the gentian are, so far as chemical reactions go, just the same. I have carefully examined the different parts of the harebell (*C. rotundifolia*), with the result of finding the quantity of pigment in the petals to be very small, and their colour to be really not a pure blue, but more or less purple. With regard to the gentian, it is well known that the order to which it belongs is specially rich in aromatic principles, calculated to furnish a basis for the production of vivid and brilliant pigments. The difference, therefore, in the matter of stability which these two flowers exhibit on drying is, I think, solely to be attributed to the relative quantities of the colouring-matters present in the petals when they were put in the press, *i.e.*, the harebell with its small leaves contains very little, while the gentian, with its abundant chlorophyllaceous tissue and highly favourable habit, produces very much more. Then again, that some gentians gathered in Switzerland twenty years ago, should now be as fresh as ever, is an extremely interesting fact, inasmuch as it evinces how dependent the blue and red tints of flowers are upon the brilliant and prolonged sunlight of the alpine regions. Where, on the other hand, as among the equatorial Andes, there is almost perpetual fog and mist, nothing but yellow flowers are produced. Finally, the fact of the harebell being stained by an inner book-cover and fly-leaf is nothing more remarkable than that of a claret stain on an ordinary table-cloth or napkin.—*P. Q. Keegan.*

GEOLOGY.

The "Underground Geology of London."—The argument quoted by "Llesba" from Mr. Whitaker's important work on the above subject, is certainly a strong one in favour of deciding the age of the doubtful red and grey beds as triassic. The last edition of the book was in the press at the time of the discovery of coal at Dover, and consequently did not take cognisance of that fact. The remarks, therefore, which Mr. Whitaker made in his paper before the Society of Arts on April 23rd, 1890, were made subsequently to the writing of the passage which was quoted, and in this paper was the following. "A few years ago there seemed to me to be a balance of probability in favour of the new red, but I now fear the balance has veered round, for some of these red and grey beds at Streatham are more like old red, or to the passage-beds from that formation into the underlying Silurian, than to anything else." It is well to bear in mind, that at a depth of 1255 feet "some small objects, believed to be *first remains*, occurred" in slightly differing sandstone to those above, while in the last two feet (1257 feet and 1258 feet), the rock was "a hard grey micaceous sandstone containing *carbonaceous* fragments."—*Edward A. Martin.*

NOTES AND QUERIES.

Ant Communities.—Sir John Lubbock, in a recent lecture on the Habits of Ants, said that the question naturally arose whether ants were moral and accountable beings. They had their desires, their passions—even their caprices. The young were absolutely helpless. Their communities were sometimes so numerous that, perhaps, London and Pekin were almost the only cities which could compare with them. Moreover, their nests were no mere collections of independent individuals, nor even temporary associations like the flocks of migratory birds, but organised communities, labouring with the utmost harmony for the common good. The remarkable analogies, which to our human societies they presented in so many ways, rendered them peculiarly interesting to us, and one could not but long to know more of their character, how the world appeared to them, and to what extent they were conscious and reasonable beings. Various observers had recorded, in the case of ants, instances of attachment and affection. He had never, in the whole course of his observations, noticed a quarrel between two ants belonging to the same nest. Within the limits of the community all was harmony. On the other hand, it must be confessed that ants not belonging to the same nest were always enemies, even if belonging to the same species. Sir John went on to give details of a number of interesting experiments and observations which, he contended, might be held to prove the possession by the ant, of an almost human intelligence. One result which he deduced was, that even in the largest nests the ants all recognised their companions. He had invariably found that if a strange ant, even of the same species, was introduced into a nest, she was sure to be attacked and driven out. He had also made some experiments on the power possessed by ants of remembering their friends, and he found that after a year's separation they did so.

Fruit and Blossom.—In your December number, a correspondent mentions his having seen an apple-tree this year bearing fruit and blossom at the same time. At Bramford, in September, I noticed a pear tree having several bunches of blossom, together with a fair quantity of rapidly-ripening fruit. A friend, too, has to-day told me of an apple-tree he saw in September, near Portsmouth, which had a great quantity of bloom, but no fruit. In the example I observed at Bramford, there was not that lack of leaves mentioned by Mr. Horn.—*L. Creaghe-Haward, Bramford, Ipswich.*

Marcle Hill.—Some time ago, I remember seeing an enquiry in Science-Gossip (I think it was the February or March number), from a gentleman in Merthyr Tydvil, asking some reader to give him particulars and peculiarities of Marcle Hill, near Woolhope, Herefordshire. Having lately spent my holidays at Woolhope, I venture to describe this hill as best I can. In my edition of Camden's "Britannia," a note runs thus:—"Near the conflux of the Lugg and the Wye, eastward, a hill, which they call Marcley Hill, in the year 1575, roused itself up, as it were, out of a sleep, and for three days together, shoving its prodigious body forward with a horrible roaring noise and overturning all that stood in its way, advanced itself (to the great astonishment of the beholders) to a higher station; by that kind of earthquake, I suppose, which the naturalists call Brosmatia." In my opinion the moving, or upheaving, of this hill has left nothing in particular visible that is not common to other hills situated in Herefordshire, to show that an earthquake ever took place here. At the foot of Marcle Hill is a large road-stone quarry. A footpath runs along the top of the hill for about a mile. The view from the summit of this hill, on a clear day, is magnificent. The hill is surrounded by cultivated fields, and there is a chapel called Kinnaston, standing, I should imagine, close to the spot where the former Kinnaston Chapel stood, before the moving of Marcle Hill. The hill itself is on one side covered with shrubs, bushes and trees, the other side appears to be cultivated.—*David J. Bevan, Birmingham.*

V. C. Album.—In reference to a note I saw in a recent Science-Gossip on the occurrence of *V. C. album* in Caernarvon, it may be of interest to your readers that I saw several specimens at the end of August, at Tynigraes, near Dolgelly, and one at Nevui, Cærnarvon. At the former place I also found *C. xerampelina* on an ash tree. *C. edusa* seemed quite common everywhere in North Wales, and I have seen a good many about here (Hereford) this year, where their occurrence is unusual. In Kent I saw simply swarms of them, with some *helice.*—*A. E. Boycott.*

Is the Hedgehog really unaffected by Poison.—From time to time I have noticed in your valuable paper, Science-Gossip, reports from various correspondents asserting that poisons of different kinds have no effect whatever on the hedgehog, and this is again repeated in a note for the current month, November. We live in a street with the house coming right up to the pavement in front, and the back and sides thereof inclosed by a wall at least five feet in height. A few years ago consternation reigned in our kitchen in consequence of what was then believed by the servants to be a large rat which had appeared in the larder. By the direction of my mother some of Keating's vermin-killer was obtained and put into some bread and milk in a saucer and placed on the floor of the larder; on the following morning a fine hedgehog was found dead therein. Thinking that the above fact might interest your numerous correspondents I venture to forward this brief note.—*Carleton Rea.*

Reply to Mr. Chaytor's Query.—A gallon of water contains 277·28 cubic inches; area of ¾-inch pipe, ·4417 of an inch; therefore, length of pipe to hold one gallon 627·75 inches.—*J. Terry.*

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

L. Wright.—Yes, stones do *grow*, but they grow *less!* that is by weather and chemical action. The too common notion that "stones grow" (like potatoes) is absurd. The idea usually applies to the stones ploughed up from the boulder clays.

Agrion.—Apply to Mr. W. Harcourt Bath, 195 Ladywood, Old Birmingham.

EXCHANGES.

Wanted, a collection (herbarium specimens, accurately named) of British grasses and sedges.—Mr. Turner, The Gardens, Buile Hill, Pendleton, Manchester.

B. Leachii, L. glabra, C. Rolphii, H. Jenkinsi, and many others, offered in exchange for *P. roseum, L. glabra, L. radiatula, H. lamellata, H. revelata,* etc.—Arthur S. Poore, Seivour Cottage, Abbey Road, Belvedere, Kent.

Jurassic brachiopoda from the Cotteswolds, offered for brachiopoda from other localities. Lists exchanged.—Chas. Upton, Merton Lodge, Stonehouse, Glos.

Wanted, to exchange eggs of roseate tern, laughing gull, noddy, sooty tern, Bartram's sandpiper, etc., for others not in collection. Please send lists to—W. Wells-Bladen, Stone, Staffs.

Exotic butterflies: *Urania rhypheus, fulgens, Papilio Paris, vernalis, Morpho Menelaus, Orn. Brookiana, aruana,* and other rare and splendid species in duplicate; also wings of ditto for the microscope. Wanted, *P. ascanius, Photinus cacicus, aristeus, epaminondas,* etc.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

Wanted, odd vols. of Sowerby's "English Botany" (3rd ed.), except 7, 8, and 9; also Boreau's "Flore du Centre." Offered, classical or theological works. — E. F. Linton, Crymlyn, Bournemouth.

Micro. slides. Selected or strewn slides in exchange for insect or botanical mounts.—T. B. Bessell, 8 Elmgrove Road, Bristol.

Offered, fossils and minerals from all formations, in exchange for modern theological works, bound volumes of "Great Thoughts," or novels by G. Macdonald, J. M. Barrie, or Conan Doyle. Good value given. Send lists to—James Marsden, Enterprise Buildings, Preston.

Van Tieghiem's "Traité de Botanique" (1891), Bower and Vine's "Practical Botany (36 slides to illustrate same), Strasburger's "Practical Botany," Asa Gray's "Structural Botany," Aitken's "Botany," Morgan's "Flowering Plants," and other Botanical works. Want works on Calculus, or high-class geological literature, or rocks, minerals, rock slides, or fossils.—Wilmore, Trawden, Lancs.

Marine shells from New Zealand offered for foreign land and freshwater shells, microscopic slides illustrating useful or noxious insects, or botanical or entomological lantern slides.——W. A. Gain, Tuxford, Newark.

Offered, a few butterflies and moths, English and Canadian, in exchange for diptera, English or foreign.—Miss G. R., 25 Cleveland Square, London, W.

Wanted, the skull of a dog.—Parritt, 8 Whitehall Park, Hornsey Rise, N.

For exchange, Cambrian and Silurian trilobites and graptolites, corals, etc. Wanted, foreign shells and fossils from all formations. Lists exchanged.—W. H. Banks, Ridgebourne, Kington, Herefordshire.

Wanted, the nests, cells of bees, and a few specimens of the bees themselves; also lantern-slides of animals and vegetables, in return for my microscopical slides. Apply to the Rev. J. E. Vize, Forden Vicarage, Welshpool.

One hundred micro. slides in exchange for other slides, material, accessories, or books.—John T. Neeve, 68 High Street, Deal.

What offers for 72 numbers of Science-Gossip, 1886–1892; also 26 numbers of "Journal of Conchology," 1886–1892, in good condition, some uncut?—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

Offered, preserved (dry) specimens of star-fish, sea-urchins, etc., and microscopic material; also "Dr. Carpenter on the Microscope" (pub. 1857), 760 pages, 345 wood engravings. Wanted, the rarer British land and freshwater shells, or foreign shells.—F. W. Wotton, Mount Stuart, Rothesay.

Science-Gossip wanted for 1869–74, and also for 1878, 1880, 1883, and 1884; must be clean and in good condition.—Walter E. Collinge, Editor "The Conchologist," Birmingham.

Wanted, single copies of "British Naturalist" for January, 1891, September to December (inclusive), 1891, and January to September (inclusive), 1892. Offers to—E. W. Swanton, Doddington, Sittingbourne.

Fossils, etc., from Faringdon (sponges), Swindon, Devizes, Isle of Wight, Barton clay, Isle of Purbeck, etc.; also phosphatic chalk from Taplow, in exchange for fossils or other geological specimens.—A. C. Salter, 8 Venetia Road, Finsbury Park, N.

Wanted, material or dredgings containing foraminifera from all parts of the world. I will give named and mounted forms in exchange, or slides in other departments of microscopy.—Frank S. Morton, *158 Cumberland Street, Portland, Maine, U.S.A.

Wanted, "The Monthly Review," 23 volumes, 1793–1800. Offers, conchological (British), microscopical, or as part exchange for telescope.—Rev. W. H. Skan, St. John's, Hendon, Middlesex.

Shells from the Pleistocene clays, Paisley, for exchange. Wanted, foreign stamps, or geological or conchological literature. Lists exchanged. Silence a negative.—Walter C. Shields, 36 Garturk Street, Crosshill, Glasgow.

Exchange—8 vols. Waverly Novels (cost 72*s.*), 2 vols. "History of the World (half-calf, 21*s.*), "Science and Art of Religion" (7*s.* 6*d.*), Figuier's "Human Race" (7*s.* 6*d.*), "Dulce Domum" (5*s.*), vol. i. "Science Siftings" (bound, 5*s.* 6*d.*); the above all new; 5 vols. "Union Jack" (bound), and many other books. No reasonable offer refused. Wanted, Morgan's "Animal Biology," Huxley's "Biology," Hurst's "Zoology," and other standard works on kindred subjects.—Shoosmith, Stopsley, Luton, Beds.

Wanted, "Vertebrate Fauna of the Outer Hebrides," by Buckley and Harvie-Brown.—P. Ralfe, 4 Queen's Terrace, Douglas, I. of Man.

Offered, a lapidary's hand-machine for cutting rock sections, strong and well made. Wanted, books on petrology or geology, micro.-spectroscope, or offers.—R. de H. St. Stephens, 25 Fordwych Road, West Hampstead, N.W.

Columbella mercatorea, Fissurella barbadensis, Phasianella barbadensis, Planaxis lineatus, Tellina Rombergii. T. tigerina, Voluta musica, and other West Indian shells, offered in exchange for land or marine shells not in collection, or Lyell's "Student's Manual of Geology." Lists exchanged. —J. Burman Rosevear, 51 Crouch Hill, London, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Transactions of the Hertfordshire Natural History Society and Field Club" (London: Gurney & Jackson).—"The Entomologist's Record" (London: Elliot Stock). — "The Naturalist's Journal" (London: W. Longley).—"The Canadian Entomologist" (London: London Printing and Lithographing Co.).—"Man and the Glacial Period," by G. F. Wright, D.D., LL.D., etc. (London: Kegan Paul, Trench, Trübner & Co.).—"A Memorial of Joseph Henry" (Washington: Government Printing Office).—"U.S. Geological Survey" 1889 and 1890 (Washington: Government Printing Office).—"List of Members of the Geologists' Association" (London: University College, Gower Street).—"The Botanical Gazette" (Bloomington, Indiana). — "The Annals and Magazine of Natural History" (London: Taylor & Francis).—"Insect Life" (Washington: Government Printing Office).—"Technics."—"Nature Notes" (London: H. Sotheran & Co.).—"Feuille des Jeunes Naturalistes."—"The Naturalist" (London: Lovell Reeve & Co.)—"The Chemistry of Life and Health," by C. W. Kimmins, M.A. (London: Methuen & Co.).—"Health and Beauty in Dress," by Mrs. Ada S. Ballin (London: John Flack).—"The Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—"The Mining, Manufacture, and Uses of Asbestos," by Mr. J. Alfred Fisher (Office of "West Ham Guardian," Stratford).—"The Midland Naturalist" (London: Simpkin, Marshall & Co.).—"Observations on Dew and Frost," by the Hon. R. Russell, F.R. Met. Soc. (London: Edward Stanford).—"The Idler" (London: Chatto & Windus).—"Baby" (London: The Hansard Publishing Union).—Longman's "Notes on Books." —"The Herald of Health" (London: Messrs. Nichols & Co.). —"A Few Remarks on what has been done with Screw-Propelled Aero-Plane Machines," by F. G. Stringfellow (Chard: Young & Sons).—"The Building of the British Isles," by A. J. Jukes-Browne, B.A., F.G.S. (London: George Bell & Sons).—"Les Champignons de France," (Paris: Imp. Hy. Tribout, 10 Rue Jacques Cour).—"Child-Life Almanac," 1893.—"The Naturalist on the River Amazons," by Henry Walter Bates, F.R.S. (London: John Murray, Albemarle Street), etc., etc.

Communications received up to the 10th ult. from: W. A.—P. R.—A. E. B.—H. A. G.—F. H. S.—Rev. H. F.—E. H.—C. E. A. M.—R. S.—Mrs. A.—C. H. J. B.—E. W. S.—H. C. S.—F. H. D.—P. R.—F. S. M.—Rev. W. H. S.—J. L.—A. D.—J. T.—D. J. B.—R. B. P.—M. A. D.—W. E. C.—W. E. S.—W. C. S.—L. C. H.—E. A. M.—H. F.—F. W. W.—J. E. V.—T. E. S.—I. T. N.—W. H. B.—H. W. P.—G. R.—W. H. H.—W. A. G.—A. W.—J. M.—C. R.—R. Botanic Society.—J. E. C.—C. H. B.—E. W. S.—J. C. S.—J. B. B.—C. U.—E. H.—H. N. H.—W. H. B.—J. T.—W. W. B.—E. F. S.—P. G. K.—R. Institution.—H. G. W.—A. S. P.—J. W. T.—J. W. D. K.—R. de H. St. S.—F. R.—J. B. R., etc., etc.

NOTES ON THE CONCHOLOGICAL SOCIETY'S NEW LIST OF BRITISH MOLLUSCA.

By T. D. A. COCKERELL.

[*Continued from p.* 16.]

M*ODIFICATIONS of a racial character, continuously inherited, independently of the normal form.*

It is hardly necessary to dwell on these, further than to remark that they are often so by virtue of isolation, and if brought into connection with the normal form would speedily be reduced to the rank of mutations by intercrossing, if their characters did not become obliterated. It is for this reason that we do not call them true species, but they are, of course, a further step towards the formation of species.

So much for preliminary remarks; I will now proceed to notice various points in the list which seem to call for criticism or comment, omitting mere matters of opinion, and also numerous matters which I do not feel competent to discuss, without more research than I have time for.

1. *Arion ater*, var. *bicolor;* why credited to Roebuck, instead of Moquin-Tandon?

2. *A. ater*, var. *nigrescens* (*Razoumouskii*) is omitted, though hitherto accepted as valid by Mr. Roebuck, and the same remark applies to vars. *pallescens* and *succineus*.

3. *A. ater*, v. *cinerea* (=*cinerascens*) is omitted, though described as new by Mr. Roebuck in "Naturalist," 1888, p. 284, from a Nottingham specimen.

4. *Limax maximus*, var. *cinerea*, Moq., is really Müller's *L. cinereus* α, which is the same as *cinereo-niger*. The English v. *cinerea* of Roebuck is doubtless a different thing, and correctly referred to *maximus*.

5. *L. flavus*, where is Mr. Roebuck's var. *griseus.?* Is it considered a synonym of var. *maculatus*, Kal.? It should be mentioned that Moquin-Tandon's *maculatus* is different from Kaleniczenko's, and being of more recent date, stands in need of a new name. It may be called *nigromaculatus*, being brown with black spots. The varieties *tigrinus* and *colubrinus* of Pini are closely allied, and all three were found by Pini at Esino.

6. *Agriolimax agrestis*, var. *filans*, which is dropped, is certainly not more distinct than several mutations which have not yet been named.

7. *A. agrestis*, var, *albida*, as usually accepted in England, is really var. *alba*, Ckll. There has been some difference of opinion as to the true var. *albidus*, but at all events, it seems not to be an albino, like *alba*.

8. *Hyalinia cellaria*, var. *compacta*, Jeff., omitted from the list, has been regarded as identical with the earlier named var. *silvatica*, Mörch; while var. *complanata*, according to Westerlund, is not separable from the type.

9. *Helix aspersa*, var. *grisea*. Why is this omitted? The name was an ill-chosen one, but the variety, as generally recognised, is quite a local race in some districts.

10. *Helix nemoralis*. The var. *carnea*, introduced some years ago by Messrs. Roebuck and Taylor, was not defined, and now it disappears without having given a proper account of itself. The only description of it I have seen is that given by Mr. Williams in 1889.

11. *Helix hortensis*, var. *pallida*, which is omitted, is to some extent a geographical race, according to

my observation, though it may occur occasionally in localities outside of its usual range. The same remarks apply to var. *lilacina*, which is included. It should be noted that the var. *pallida* is very pale purplish, not pale yellowish, as I have seen it described.

12. *H. hortensis*, var. *roseolabiata*. I have preferred for this the prior name *hybrida*, Jeffreys, but owing to the confusion that has existed about so-called *hybrida*, there is something to be said in favour of Mr. Taylor's name. It would seem, however, that this form was included in Colbeau's var. *sauveuri* (1866), although Westerlund gives that as a synonym of var. *fuscolabiata*, Kregl.

13. *H. hortensis*, var. *umbilicata*, which is omitted, is practically the same as Westerlund's var. *perforata* (1871). The var. *major* is also left out, and rightly, since it has never been defined; but I have taken a remarkably large form, which it seemed possible to include under Westerlund's var. *crassa*.

14. *H. hortensis*, var. *sinistrorsa*. Credited to Mr. Taylor, but did not Miss F. M. Hele first name it in "Journ. Conch.," vol. i. p. 248? The same remark applies to the sinistral form of *H. aspersa*.

15. *H. arbustorum*. What has become of var. *Baylei?* Is it considered the same as var. *alpestris*, following Servain? The var. *alpestris*, according to both Westerlund and Servain, should be known as *alpicola*—the last-mentioned author regarding it as a species.

16. *H. cantiana*. Why are not the small varieties included? The var. *albocincta* must be very similar to var. *anconæ*, Issel, judging from the description of the latter.

17. *H. cantiana*, var. *albida*, Taylor, is a synonym of var. *alba*, Colbeau, 1866.

18. *H. rufescens*, var. *depressa*. Locard named a var. *depressa*, but I believe did not describe it. I have not seen any description by Mr. Taylor either, but it may well be in some publication to which I have not access in Jamaica.

19. *H. hispida*, var. *albida*. By the union of *concinna* with *hispida*, there have come to be two vars. *albida*. The *H. concinna*, var. *albida* of Jeffreys may stand as *H. hispida*, var. *alba*, having been called *concinna*, var. *alba*, by Mr. Williams in 1889. ("Land and F.-W. Shells," p. 83.)

20. *H. caperata*, var. *nana*, is a distinct little form, which might well have been included. I found it forming a local race at Teddington, and have given specimens to the Conchological Society.

21. *H. virgata*, var. *subdeleta*, is a characteristic British form, though occurring elsewhere; it should surely have been included.

22. *H. terrestris*. I have seen var. *hypozona*, Moq. among the English specimens, though not quite characteristic. The specimens were sent to me by the Rev. J. W. Horsley.

23. *Buliminus obscurus*, var. *brevis*, Brown, is, I believe, a distinct variety. It was originally from Fifeshire, and is shorter and more inflated than the type, with a more acute apex.

24. *Clausilia biplicata*, var. *tridentata*, which is omitted, is, I think, strictly a monstrosity. I had only one specimen.

25. *C. Rolphii*, var. *nitida*. As this name has been published ("Journ. of Conch.," 1891, p. 392), although not given in the list, I may as well furnish a description. It is 13 mill. long and 3½ broad, deep red-brown, shiny, not so tumid as the usual form, striæ not quite so close together. This form has the same dimensions as var. *digonostoma*, Bgt.; it was sent to me by the Rev. J. W. Horsley, and collected at Plumstead. What I regard as the type-form of the species, also from Plumstead, is 12 mill. long, 3½ broad, horn-colour, shiny.

26. *C. rugosa*, var. *crenulata*, Crowther, omitted from the list, is preoccupied by a continental var. *crenulata*, Risso, 1826. If Mr. Crowther's variety should be considered a valid one, it must have a new name; it is distinguished by "having the mouth closed by a varying crenulated inner lip, the projections being small teeth of different lengths and thicknesses." It was found at Roundhay, near Leeds, and described in the "Leeds Mercury."

27. *Stenogyra octona*, as well as *S. Goodalli*, occurs as an introduced shell in greenhouses. It is recorded from near Manchester by Mr. J. R. Hardy; and I recollect seeing some specimens years ago, but have forgotten where they were obtained.

28. *Helix carthusiana*, var. *major*, Jenner (15 mill. diam.), is omitted, and no doubt rightly, as there is an earlier var. *major* of Westerlund (18 mill. diam.). Unless the minimum dimensions of the latter are to be brought down to 15 mill., Mr. Jenner's variety must be dropped, or else receive a new name.

29. *Cochlicopa lubrica*, var. *exigua*, Mke., takes the place of var. *minima*, Siem., of the "B. Nat. Cat."

30. *Succinea suecica* of the "B. Nat. Cat." is the same as *parvula*, Pascal; and *S. acuta* is probably *S. putris*, var. *limnoidea*. The arrangement of *Succinea* in the new list is very different from that of my catalogue, but if a careful examination and study were made of the British species and varieties of this perplexing genus, no doubt the result would differ as widely from both as they do from one another.

31. *Planorbis umbilicatus*. If Westerlund is correct in identifying this with the *Helix planorbis*, Linn., it ought in strict priority, to be called *Planorbis planorbis*. Macgillivray ("Conch. Text-Book," 9th ed., p. 57), identifies *Helix planorbis* with *Planorbis carinatus;* very possibly Linné did not discriminate between the two species now called *carinatus* and *umbilicatus*.

32. *P. corneus*. Why are the *major* and *minor* varieties introduced as British in the Trans. Yorks. Nat. Union, left out?

33. *Physa hypnorum*, var. *angulata*, which is omitted,

was described from one specimen, and is, I think, an individual monstrosity; very likely other specimens will occasionally be found, as is usually the case with such forms. The same remarks apply to *Limnæa glutinosa*, var. *intorta*.

34. *Limnæa stagnalis*, var. *speciosa*, which is omitted, is a very distinct-looking variety.

35. *L. stagnalis*, var. *elegantula*, is omitted, though it is a very remarkable little variety. My brother and I noticed that one year, when the pond containing them increased in size from abundant rains, the *elegantula* came to resemble more the forms found in neighbouring ponds; but nevertheless, the variety seems distinct, and I have never seen anything that could be confounded with it, except perhaps the var. *minima*, of which I saw only one example. The var. *minima*, found at Milford, Yorks, by Mr. Geo. Roberts, is 20½ mill. long, 9 mill. diam., whorls 6, spire slender, aperture oblong, inner lip thickened. It has, I believe, the same relation to *stagnalis* proper that *elegantula* has to var. *lacustris*.

The variety *bottnica*, Cless., is included in the list, and I believe Mr. Taylor considers *elegantula* identical with it. But certainly the two must have had an independent origin, and var. *bottnica* belongs to the section in which the shell is clear horn-colour or whitish—very different from *elegantula*, which is dark brown, and differs also from the usual forms in the colour of the animal.

36. *L. stagnalis*, var. *expansa*, is omitted, no doubt being included in var. *lacustris*, of which it is a sub-variety.

37. *L. stagnalis*, var. *scalariformis*, is omitted, although very good specimens have been found. The same may be said of the scalariform *Bythinia tentaculata*, of which Mr. Geo. Roberts sent me a specimen from Milford, Yorks. Is it not rather inconsistent to leave these out, when similar forms of other species are included?

38. *L. stagnalis*, var. *compressa*, is omitted, though it is a distinct variety. I have seen it referred to Roberts' *palustriformis*, but no doubt wrongly, as that is a slender, thin-shelled variety, 40 mill. long, Curiously, Mr. Bryant Walker has just described and figured as new a var. *sanctæmariæ* from Michigan, which appears to be practically the same as *compressa*. Of the two figures he gives, his Fig. 5 ("Nautilus," 1892, pl. 1.) most resembles the English specimens.

39. *L. palustris*. The forms *carinata*, *globosa*, and *turrita*, which are omitted, are no doubt individual monstrosities. The var. *angulata*, also omitted, is not a mere monstrosity, as two or three were found in the same pond, from which I infer that the peculiarity is more or less racial.

40. *Acme lineata*. I never had the material to judge of the matter, but it seems certain that we have two forms, perhaps to be known as *lineata* proper, and *fusca*, Walk. and Boys, or *polita*. Captain Brown recognised two forms, describing one as *Acme minuta*, from Lanarkshire.

41. *Vertigo* seems at best only a subgenus of *Pupa*; there may be some question whether we should not write *Pupa vertigo*, Mont., instead of *P. angustior*. There was, however, an earlier *Pupa vertigo*, Gmel., 1788, which is a synonym of *P. pusilla*, Müll., 1774.

42. *Bythinia Leachii*. Several years ago Mr. Geo. Roberts sent me a ventricose form of this, measuring 4 mill. long and 3¼ broad. It was found by Mr. Hargreaves, in the Bolton Canal, near Manchester. I will not propose a name for it, as it may possibly be var. *inflata*, Hansen, 1845, of which no description is available to me.

43. *Bythinia tentaculata*, var. *angulata*, is omitted, but it is propably a variation similar in character to *Limnæa palustris*, var. *angulata*. Mr. Roberts sent me two specimens, found in the Leeds and Liverpool Canal, Saltaire. In one the angulation appeared to commence at the apex, but the other had the apex normal, the angulation beginning only on the penultimate whorl.

44. *Valvata piscinalis*. Why is var. *albina*, Taylor, left out?

45. *Pisidium pusillum*, var. *circulare*, which is omitted, is only known from one specimen, taken in Langorse Lake, Breconshire. The typical form also occurred, so it is possible that *circulare* is an individual aberration, although it seemed a distinct variety. Further research is very desirable, as it is not improbable that the British lakes, if adequately searched, would produce peculiar races of *Pisidium* as do those of Switzerland.

46. *Pisidium nitidum*, var. *globosum*, was, I believe, originally named in MS. by the late Dr. Gwyn Jeffreys, from specimens taken at Swinton by Mr. T. Rogers. See J. C. Melvill, "Mollusca," (Brit. Assoc. pamphlet), p. 3.

47. *Unio tumidus*. There was a very remarkable variety found in Regent's Park, and named *richensis*. I have seen specimens in the British Museum, and there is an account of it in Mr. Harting's work on shells. Yet nobody appears to have taken it of late years. There are some very similar North American species, and possibly it may have been one of these imported, as it looked very distinct from *tumidus*.

The above comments are only a few of the many that might be made, as the subject is full of debateable points. Probably much that now appears obscure will be cleared up in the long-promised monograph, and the readers of this journal could, no doubt, throw fresh light on most of the matters above discussed.

So far from deprecating the increased interest lately shown in "slight varieties," I believe it to be an indication that the time is now passing away, in which systematic zoology is confined to the consideration of genera and species; and that the doctrine of evolution, now fully accepted by the younger generation, is causing us to regard with interest all those factors which give rise to new developments, and most of all those which, acting at the present time, are capable of being directly observed.

Astronomers, by making themselves familiar with the nature of things on this earth, are able by analogy to reason out the nature of the stars, bridging space, so to speak, in a way that would, not many years ago, have seemed incredible. So also, by observing the origin of slight varieties and mutations in the present, we may learn something of the history of genera and species, the actual origin of which is buried deeply in the past.

The much-abused names are simply a matter of convenience—that they are convenient can hardly be doubted by anyone who often has occasion to refer to the forms they represent. The most serious difficulty as to names at present seems to be the danger of naming from British examples varieties previously named on the continent. Those who can, might purchase Westerlund's great work with advantage, but this is very incomplete as regards mutations. I have myself been at some pains to collect foreign records, and will gladly give any information I can to anyone who cares to address queries to me on the back of a three-halfpenny postcard. I cannot, however, undertake to examine shells.

NOTES ON NEW BOOKS.

BRITISH New Guinea, by J. P. Thomson (London: George Philip & Son). A new book on this wonderful land was much needed. M. D'Albertis' work was published ten years ago, and now fetches a high price. Had we known as much about it then as we do now, New Guinea would by this time have been solely a British possession, instead of being divided between England and Germany—the latter country probably getting the better half. It is a country which was bound to be annexed by some European power ere long, and its contiguity to Australia plainly indicated it ought to have come under British protection. Moreover, from a general scientific and natural history point of view, the cost and work of exploring it, had been accomplished almost entirely by Englishmen, counting our Australian fellow-subjects, of course, as such. Mr. Thomson's work is a splendid contribution to our knowledge of this beautiful land. It is well printed, and abundantly as well as charmingly illustrated and bound—quite a volume *de luxe*. It gives a short historical résumé of the various exploring expeditions from the coast into the interior, notably that of Sir William Macgregor. The ethnology, manners, and customs of the natives, the physical geography, (and geology as far as possible), the

Fig. 18.—Flat-topped mountains of Paraná-quára, Lower Amazons. (From new edition of Bates' "Naturalist on the Amazons.")

botany, zoology, &c., all come in for notice by Mr. Thomson, who discourses on New Guinea, both enthusiastically, and optimistically. It is a delightful book to read, as all its readers will allow.

The Naturalist on the River Amazons, by Henry Walter Bates. With a memoir of the author by Edward Clodd (London: John Murray). This is a reprint of the unabridged edition of this famous book, published nearly thirty years ago. It ranks with Darwin's "Voyage of the Beagle" in its fascinating originality, and capacity of observation; and reads with a charm that would put any but a leading novel into the shade. Never before was the animal and distinguished naturalist is powerfully and sympathetically written by Mr. Edward Clodd, and runs to nearly a hundred pages. The frontispiece is a highly artistic photograph of the author, taken at its best, the beloved face seamed with scores of lines of hardship and thought. The get-up of the book, paper, printing, binding, and illustrations, renders it a fitting monument to one of the most modest, most learned, and most original of the brilliant gallery of modern British naturalists.

Fig. 19.—Interior of Primeval Forest on the Amazons. (From new edition of Bates' "Naturalist on the Amazons.")

vegetable life of the tropics so vividly and carefully portrayed, for its distinguished author had a powerful imagination, as well as a photographic eye for all details. We feel as if we had travelled amid the scenes as we conclude chapter after chapter; and when the writer of this brief notice first rambled in tropic forests, they appeared quite familiar, thanks to the impression made by "The Naturalist on the Amazons," many years before. It was in this work that the doctrine of "Mimicry" was first suggested, and supported by a multitude of facts. For eleven years Mr. Bates lived and wandered in the enchanted land he so vigorously describes, collecting, observing, and noting facts. The memoir of the

The Field Club. (Elliot Stock, 62, Paternoster Row, E.C.) This is the annual volume of a capital magazine of general natural history, and edited, moreover, by the Rev. Theodore Wood, F.E.S. It contains some very interesting articles, among the foremost of which may be mentioned "The Wild Horse, Ancient and Modern." This paper goes back to Neolithic and Palæolithic times. "Bird Life of the Norfolk Broads" brings out the keen ornithological observation of the author, the Rev. H. Bird, M.A.; "Some Fragments of Geological History," by G. W. Bulman, M.A., B.Sc.; and "Biological Recreations," by R. Lawtor Roberts, M.D., are well-written papers. As a volume, the "Field Naturalist" is a very interesting one. It makes a capital gift-book, being printed on good paper, and well bound.

Catalogue of Eastern and Australian Lepidoptera Heterocera, by Col. C. Swinhoe (Oxford: Clarendon Press). The first part of this fine work, which includes all the synonyms and a few localities, has just been printed by H. Hart at the Oxford University Press. It does Colonel Swinhoe great credit, and brings out in the clearest possible way the trouble and pains he has taken in compiling and drawlng up such a splendid book. The text is clear and concise, and the plates leave nothing to be desired. The initial part of the work, which is all that has been as yet published, embracing only the Sphinges and Bombyces, numbers some twelve hundred and forty-eight species, together with a hundred and forty-two figures in eight plates. To many of the less known species descriptions are affixed. It is a book that has for some time been much needed by lepidopterists interested in eastern entomology, as former works on the same subject have been liable to inaccuracy and incongruity. We strongly recommend it to all entomologists interested in the subject. The "Catalogue" is devoted to a description of the collections in the Oxford University Museum.

The History of Creation, by Prof. Ernest Haeckel (London: Kegan Paul, Trench, & Co., 2 vols.). We had the pleasure to notice the first English translation of this remarkable work when it appeared in 1876. Since then, enormous strides have been made in evolutionistic philosophy, to say nothing of the vast treasury of new facts and discoveries which have accumulated in the interim. A new edition was much needed, and the value of the present re-issue will be understood by the fact that the translation has been made under the revision of Prof. Ray Lankester, who also contributes a short preface. Readers of the first English edition will find that the author has much modified some of his views and conclusions. There is also much new matter introduced, rendered necessary by recent advances in biological knowledge. The present work now includes all the views and theories of the neo-Lamarckian and neo-Darwinian schools of thought, so that (in the first volume particularly) the entire subject is brought up to date. Since Prof. Haeckel's work was first translated, the vast amount of new materials accumulated during the voyage of the *Challenger* have been sorted out and worked up. They are all, of course, duly and carefully dealt with. In Germany Prof. Haeckel's two-volumed work has already passed through eight editions. The present translation is admirably presented to the British public from a literary point of view. It is eminently clear and readable, free from verbosity, (a fault in translations from the German), and as far as possible untechnical. It is altogether a grand work, and one that every earnest student of natural science will peruse with profitable delight. The numerous illustrations are all unusually good; and the type and paper pleasureable to look at, and comforting to the eyes. Every scientific society library in the three kingdoms should give Prof. Haeckel's work an honourable place on their shelves.

An Introduction to the Study of Botany, by Dr. Arthur Dendy, and A. H. S. Lucas (Melbourne: Melville, Muller & Co., and London: 12 Ludgate Square). Of the issuing of botanical manuals there is no end; but a peculiar importance is attached to the present volume. It is a contribution from well-known Australian botanists to the science. It is appropriately dedicated by them to the veteran botanist, Sir F. Von Mueller. It is evidently intended for Australian students, for both the authors are professors in the University of Melbourne, and there is a special chapter (which will be welcome to students in England and America) on some Australian natural orders of plants. The work is thorough and scholarly, and it does much credit to authors and publishers alike. We cordially recommend it to all our botanical readers.

British Fungus-Flora, by George Massee (London: Geo. Bell & Sons), in three vols. The present is the first volume on this increasingly important department of botany. The indefatigable author seems to sleep with his pen in his hands, judging by the amount of good work he turns out. Mr. Massee has attained the highest distinction as a fungologist, and has succeeded Dr. M. C. Cooke, at Kew. Dr. Cooke's celebrated "Handbook of British Fungi" was published twenty-one years ago, since which time, many new species have been added to the then vast list. The present volume deals only with the *Basidiomycetes*, which number in Cooke's work, no fewer than 1980 species. Mr. Massee's book is a most important contribution to this department of botany, and contains a full and carefully compiled index. The illustrations, although not numerous, and chiefly relating to generic characters, are all evidently from the author's well-known pencil.

The Microscope, its Construction and Management, etc., by Dr. Henri Van Heurck. English edition, re-edited and augmented by the author, from the fourth French edition, and translated by Wynne E. Baxter, (London: Crosby Lockwood & Son). This magnificently got-up work is worthy of a place beside the most elaborate and costly of modern microscopes, many of which cost as much as a yacht. It is a well-known work in the microscopical world, for the writer has not only been long before the scientific public as an eminent structural botanist, Director of the Antwerp Botanical Gardens, etc., but also as president of one of the chief microscopical societies in the world—that of Belgium. The work is illustrated with three beautiful plates, and upwards of 250 superb woodcuts. It is impossible to mention anything relating to the microscope, from a three-guinea "student" to a five-hundred-guinea instrument, which is not dealt with in Dr. Heurck's splendid monograph. It is as full as the latest edition of the "Micrographic Dictionary," besides being guide, philosopher, and friend through the perplexing maze of modern microscopic research. No microscopist who can afford it, will be without this great work. We may add that the English edition is conscientiously, well, and effectively done, the translator being a Fellow both of the Royal Microscopical, and Geological Societies.

The Apodidæ, a Morphological Study. By H. M. Bernard (London: Macmillan). It is sufficient to indicate that this neatly got-up volume is the last issued of the well-known "Nature Series." It is a careful and conscientious study of one insignificant type-animal, but belonging to a group of high palæontological and biological interest, more especially as regards the phylogeny of its tribe. Mr. Bernard's book should be carefully studied (not read) by all earnest biological students. It is essentially a book for the study and the laboratory.

Man and the Glacial Period, by Dr. G. F. Wright, with an Appendix on Tertiary Man, by Prof. H. W. Haynes (London: Kegan Paul). This is the latest addition to the now deservedly famous "International Scientific Library Series," among which, if it does not rank as the greatest, it takes a good place in interest and novelty. We commend it to our clerical readers, for although its American author is a D.D., he is in no terror of the antiquity of man. The work is prefixed by a folded, admirably drawn-up "Contour and Glacial Map of the British Isles." In addition to other maps, it contains upwards of 100 illustrations. Dr. Wright's book is especially valuable to English geologists, inasmuch as, whilst it apprehends and comprehends all the glacial work done by them on this side the globe, it presents them with the clearest arrangement of similar knowledge (only on a large scale) done and published by our American confrères. We especially commend this work to the geological readers of SCIENCE-GOSSIP.

A CHECK-LIST OF BRITISH EARTH-WORMS.

By the REV. HILDERIC FRIEND, F.L.S., Author of "Flowers and Flower-Lore."

THE past year has been the most fruitful on record in its bearings on the number and distribution of our indigenous terrestrial annelids. Hitherto no list has been prepared, by means of which collectors could check their local species, and the time seems to have arrived, when such a catalogue should be drawn up for future reference. Several ends will thereby be secured. We shall see, in the first place, exactly how many British species were known to science when the year 1892 closed its record of research. We shall have a clue to the distribution of the species. A guide will be afforded to collectors who wish to identify their captures; and finally, a list will be provided for checking the same when found in any given locality.

Our earth-worms fall under four genera, and number at present twenty-five species. This is not a mean record when we remember that Darwin assumed the British species not to exceed eight or ten. I shall give a brief outline of each genus, then the names of the species, with the number of the girdle and band-segments, and their known distribution in counties. Geographically, I shall work from the south to the north. The figures in the form of a fraction after each species denote the number of the segments embraced by the girdle in the normally developed worm, and the number of the girdle segments on which the *tubercula pubertatis*, i.e., the clitellar papillæ or bands, are situated. Thus $\frac{24-31}{26:27}$ would signify that the girdle covered the 24th to the 31st segments, two of which, viz., the 26th and 27th, carry the papillæ or bands in the adult stage.

I.—GENUS LUMBRICUS.

Lip forming with the first ring a perfect mortise and tenon. Girdle of five or six segments, the innermost four of which carry a band on each side. Setæ, eight on each segment, disposed in four couples; the individuals near together. Male pores on the 15th segment, with or without papillæ. Colour dark red or brown with iridescence. Cylindrical in front, tail flattened. Exude slime when irritated, but no turbid liquid. Five species at present known in the British Isles.

1. L. TERRESTRIS, Linn., $\frac{32-37}{33-36}$. *Distribution.*—Sark, Sussex, Kent, Middlesex, Surrey, Essex, Norfolk, Wiltshire, Somersetshire, Devonshire, Gloucestershire, Buckinghamshire, Oxfordshire, Northamptonshire, Leicestershire, Hertfordshire, Nottinghamshire, Yorkshire, Montgomery, N. Wales, Lancashire, Westmorland, Cumberland, Northumberland, Dumfries, Lanarkshire, Dublin, Down, Kerry, Donegal. These records I can vouch for as the result of personal study.

2. L. RUBELLUS, Hoffm., $\frac{27-32}{28-31}$. *Distribution.*—Same as No. 1.

3. L. PURPUREUS, Eisen, $\frac{28-33}{29-32}$. *Distribution.*—Same as No. 1.

4. L. RUBESCENS, Friend, $\frac{34-39}{35-38}$. *Distribution.*—Sussex, Kent, Middlesex, Norfolk, Gloucester shire, Yorkshire, Lanarkshire, Down, Dublin, Wicklow, Donegal.

5. L. PAPILLOSUS, Friend, $\frac{33-37}{34-37}$. *Distribution.*—Dublin. [On the Continent *L. Melibœus*, Rosa,

has similarly only five girdle segments. This species, as well as *L. papillosus*, Friend, has hitherto not been found in England.]

II.—Genus Allolobophora.

Lip partially dovetailed into the first ring. Girdle segments from four to ten in number. *Tubercula pubertatis* on consecutive or alternate segments, either as papillæ or forming a distinct band. Setæ eight, in four couples, more or less irregularly disposed. Male pores as in Lumbricus. Colour-range very wide—brown, clay, flesh, green—seldom iridescent. Usually cylindrical throughout. Exudes slime or turbid fluid, sometimes very pungent. Nine species are known as British.

6. A. longa, Ude, $\frac{28-35}{32-34}$. *Distribution.*—Same as No. 1, with which it was until recently confused.

7. A. profuga, Rosa, $\frac{30-35}{31-34}$. *Distribution.*—Norfolk, Hertford, Nottingham, Gloucestershire, Montgomery, North Wales, Yorkshire, Westmorland, Donegal.

8. A. turgida, Eisen, $\frac{28-34}{31 : 33}$. *Distribution.*—Sussex, Kent, Wilts, Somerset, Devon, Gloucester, Middlesex, Essex, Norfolk, Herts, Notts, Montgomery, N. Wales, Yorkshire, Lancashire, Westmorland, Cumberland, Lanarkshire, Perth, Dublin, Down, Kerry. Formerly confused with the next, and known as *L. communis*, on which account the earlier records for Nos. 8 and 9 are not to be relied upon.

9. A. trapezoidea, Dugès, $\frac{27-34}{31-33}$. *Distribution.*—Essex, Norfolk, Somerset, Gloucester, Bucks, Herts, Oxford, Montgomery, Notts, Yorks, N. Wales, Lancashire, Westmorland, Cumberland, Lanarkshire, Kerry.

10. A. mucosa, Eisen, $\frac{26-32}{29-31}$. *Distribution.*—Sussex, Essex, Norfolk, Somersetshire, Devonshire, Montgomery, Herts, Oxford, Leicestershire, Northants, Notts, Yorkshire, Lancashire, Westmorland, Cumberland, Lanarkshire, Perth, Dublin, Down, Kerry, Donegal.

11. A. chlorotica, Savigny, $\frac{29-37}{31 : 33 : 35}$. *Distribution.*—Same as No. 1.

12. A. cambrica, Friend, $\frac{29-37}{31 : 33 : 35}$. *Distribution.*—Montgomery; other records doubtful. Note that while the girdle-formula is the same as No. 11, the two worms are totally different, both internally and externally in every other respect.

13. A. fœtida, Savigny, $\frac{27-32}{28-30}$. *Distribution.*—Same as No. 1. This is the angler's Brandling.

14. A. hibernica, Friend, $\frac{27-33}{30-31}$. *Distribution.*—Dublin, Louth.

III.—Genus Dendrobæna.

A group of small rose-brown worms found in decaying trees, with setæ usually in eight rows. Lip very delicate, the insertion of which into the first ring may be very slight or very deep. They exude a small quantity of yellow fluid from the dorsal pores, which begin between the 5th and 6th segments. See Friend, "Journal of the Linnean Society, Zoology," vol. xxiv. pp. 292 *seq.* There are now six known species in Great Britain; two years ago they were totally unknown.

15. D. celtica, Rosa, $\frac{30-36}{33-34}$. *Distribution.*—Sussex, Kent, Somerset, Devonshire, Gloucestershire, Oxfordshire, Northants, Yorkshire, N. Wales, Lancashire, Dumfries, Lanarkshire, Donegal, Dublin, Down.

16. D. arborea, Eisen, $\frac{27-31}{28-29}$. *Distribution.* Sussex, Essex, Norfolk, Gloucestershire, Herts, Yorkshire, N. Wales, Cumberland, Dublin.

17. D. Boeckii, Eisen, $\frac{29-33}{31-33}$. *Distribution.*—Yorkshire, Lanarkshire. Only two duly authenticated records. Earlier entries belong to the next. A boreal species, as No. 19 is a Southern and Continental form.

18. D. subrubicunda, Eisen, $\frac{26-32}{28-30}$. *Distribution.*—Same as No. 1. The angler's Gilt-tail.

19. D. constricta, Rosa, $\frac{26-31}{0}$. *Distribution.*—Sussex.

20. D. Eiseni, Levinsen, $\frac{24-32}{0}$. *Distribution.*—Sussex, Essex, Norfolk, Devonshire, Gloucestershire, Hertfordshire, Yorkshire, N. Wales, Cumberland, Dublin.

IV.—Genus Allurus.

Male pores on segment 13. Semi-aquatic. Five species.

21. All. tetraedrus, Savigny, $\frac{22-26}{23-26}$. *Distribution.*—Same as No. 1, with the addition of Dorset.

22. All. amphisbæna, Duges. An element of doubt lingers around this species, which I hope this year to be able to remove.

23. All. tetragonurus, Friend, $\frac{18-22}{19-21}$. *Distribution.*—Bangor.

24. All. flavus, Friend, $\frac{22-27}{23-25}$. *Distribution.*—Yorkshire, Cumberland.

25. ALL. MACRURUS, Friend, $\frac{15-22}{20 : 21}$. *Distribution.*—Malahide, Ireland.

I omit all allusion to aliens imported with soil from abroad, as well as varieties (of which many might be created) and doubtful species which need confirmation. The consignments which reach me from various places week by week give promise of new species yet to be recorded, and I should be delighted to receive material from the Isle of Man, the Scilly, Channel, Orkney, and Shetland Isles, the Highlands of Scotland, and any other unworked part of the kingdom to which this paper may go. Worms may be sent in tin boxes, lightly packed with soft moss, when they will arrive fresh and clean for immediate identification or study. My address is 4, The Grove, Idle, Bradford.

A FEW FURTHER NOTES ON EGGS.

By P. L. SIMMONDS, F.L.S.

THE majority of the Vertebrata are oviparous animals producing perfect eggs, which contain all the material necessary for the development of the embryo. Of the five classes, the first four are oviparous; namely, Pisces, Batrachia, Reptilia, and Aves.

The eggs of fishes is too wide a subject to enter upon, but they are much utilised even as food for the human race, in cod and other roes, and in caviare.

Professor Peters has lately described the mode of deposit of its eggs by a tree-frog (*Polypedates*) from tropical Western Africa. This species deposits its eggs, as is usual among Batrachians, in a mass of albuminous jelly, but instead of placing this in the water, it attaches it to the leaves of trees which border the shore and overhang a waterhole or pond. Here the albumen speedily dries, forming a horny or glazed coating of the leaf, enclosing the unimpregnated eggs in a strong envelope. Upon the advent of the rainy season, the albumen is softened, and with the eggs is washed into the pool below, now filled with water. Here the male frog finds the masses, and occupies himself with their impregnation.

Frogs and toads lay numbers of small eggs. They are dropped in the water like fish spawn, in long clusters or strings. The Surinam toad (*Pipa*) carries her eggs soldered together like a honeycomb on her back. The *Aliphes* carries them between its legs rolled up in a bunch.

Among reptiles the eggs exhibit great variety. The eggs of alligators are elongated and almost cylindrical, evenly rounded at both ends, and about the size of an ordinary duck's egg. The eggs of the sea turtle are as large as a small apple, rounded, and have a flexible shell. Those of the snapping turtle (*Chelydra serpentina*) are much smaller, but also rounded. Those of the terrapins (*Clemmys*, and other genera) are oblong, as also are those of lizards. In the common black and yellow dotted American fresh-water terrapins, and in the painted terrapin, the eggs require four years of growth before they are laid. Take a seven-year-old turtle of this kind; it will contain only very small eggs, all of uniform size. An eight-year-old tortoise of the same kind will have two sets of eggs, one larger and one smaller. One of nine years will have three sets, the oldest set being the size of a small pea. A tortoise of ten years will have four sets of eggs, and in that year she will lay for the first time, and give birth to the most mature set.

The scaly reptiles—that is, turtles, lizards, and serpents—bring forth eggs similar to those of birds. They arise in the ovary in a similar way, and produce by successive growth yolks of a similar bulk, as do the birds. While, however, all these eggs are surrounded with a shell after fecundation, the egg is not necessarily laid, as in birds, in order to bring forth the new being. The bird brings forth its young by incubation, sitting upon the eggs, and transmitting to them by its own warmth, the temperature needed for their final development. For the egg of the reptile, that temperatnre is usually derived from surrounding conditions. It is true that a few kinds of reptiles, the python for instance, sit upon their eggs, and transmit to them a higher temperature from their body; but this is not usually the case.

The eggs of the Australian lace-lizard (*Hydrosaurus varius*) are large, covered with a tough leathery membrane. They deposit some ten or fifteen. The carpet snake of Australia (*Morelia variegata*) produces a large number of eggs, from twenty to thirty. The diamond snake (*Morelia spilotes*) deposits thirty or more eggs. The ringed snake (*Natrix torquata*, Ray) produces fifteen or twenty eggs, which are covered with membrane resembling parchment, and they are agglutinated together in a chain-like necklace. Snake's eggs are oblong and sometimes cylindrical in shape.

Brown, in his work on Guiana speaking of the iguana, says: "One of these reptiles, captured at its burrow, when killed and cut for cooking, was found to contain ten eggs, of an elliptical form, shell-less and midway in size between a pigeon und a hen's egg. These are good eating, when boiled for about five minutes, and then allowed to get quite cold. They then require some manipulation. A hole is made in one end of the skin, and the albuminous part, which never coagulates, is squeezed out. Then the skin is stripped off, and the semi-hardened yolk, of the consistency of butter, is eaten with salt."

In the Mollusca we find great variety in form among the eggs. They are sometimes, as in the land-snails, laid separately, each enclosed in a shell of variable consistence; but in most cases they are agglutinated together in a mass, which sometimes takes the form of a ribbon, attached by one of its edges to some submarine body. Those of the *Bulimus* might be taken for a humming-bird's egg. The eggs of the great *Achatina* exceed an inch in lengtb, and have a calcareous shell. The tropical *Bulimi* cement leaves together, to protect and conceal their large bird-like eggs. The slugs bury theirs in the ground ; the oceanic snail, *Janthina*, attaches them to a floating raft, and the *Argonaut* carries them in her frail boat. In some marine species the eggs are enclosed in leathery capsules, which are often united in a large mass ; each capsule contains numerous eggs. The horny capsules of the whelk are clustered in groups, with spaces pervading the interior, for tbe passage of sea water. The nidamental ribbon of the *Doris* and *Eolis* is attached to a rock, or some solid surface, from which it will not be detached by the waves.

The periwinkle lays an immense mass of eggs larger than its own shell. In bivalves the eggs are usually like spawn, and generally retained by the mother. The ovaries of the Brunnion, a snail without shell, are eaten in Nicc.

The eggs of the Octopus we are told, when first laid are small, oval, translucent granules, resembling little grains of rice, and not quite an eighth of an inch in length. They are attached to a common stalk, to which every egg is separately attached, as grapes form part of a bunch. Each of these clusters contains about one thousand eggs, and a large octopus will produce forty-thousand to fifty-thousand.

The *Pyrula* lays a long string of egg-cases, each containing from fifteen to twenty eggs, or sometimes more.

The eggs of the king crabs (*Limulus gigas* and *L. moluccanus*), which are collected in large quantities, among other places on the north coast of Java, are considered a delicacy by the natives and are eaten both fresh and salted, as the spawn of the lobster is here.

DRAGON-FLY GOSSIP.

By W. HARCOURT BATH, Author of "An Illustrated Handbook of British Dragon-flies," "A Label List of British Dragon-flies," etc., etc.

[*Continued from p.* 206.]

SWIFT PREYING UPON DRAGON-FLIES.

WHILE hunting for dragon-flies near Bournemouth in August 1890, I saw a swift (*Cypselus apus*) flying over a pond in pursuit of small Odonata, including *Lestes sponsa* and various species of Agrions. Some boys informed me that a few minutes before my arrival they had witnessed the same bird capture and devour a very large dragon-fly, which I think from their description must have been a specimen of *Æschna cyanea*.

It is well known that swallows, and sometimes sparrows, feed upon the smaller species of dragon-flies. I shall be glad to know what other kinds of birds readers have seen to prey upon these insects in this country. I have read somewhere that the kestrel possesses a predilection for prey of the kind in question.

A VETERAN DRAGON-FLY HUNTER.

Mr. Robert Calvert of Bishop-Auckland, whose death was recorded last year at the age of seventy-one, was a veteran dragon-fly hunter, and one of my first correspondents concerning the Odonata.

Some years ago, in response to an appeal in the "Entomologist," he sent me a list of the dragon-flies occurring in his neighbourhood. He wrote: "They were fifty years since much commoner than they are now, partly owing, perhaps, to an enormous increase in population ; but chiefly, I think, to the pollution of all our streams by colliery operations. Some of my specimens are very old; it is fifty years since I took some of them, but they have kept their colour well."

Mr. Calvert, I may remark, is the authority for several localities for dragon-flies in my "Illustrated Handbook."

Does any reader of SCIENCE-GOSSIP know what has become of this gentleman's collection ?

DRAGON-FLIES IN DRY SEASONS.

There is a circumstance connected with the abundance of dragon-flies in dry summers which I have hitherto been unable to elucidate to my complete satisfaction. In many places in the South of England, particularly on chalky soils, there are very few streams, and the dragon-flies, for the most part, undergo their metamorphoses in small artifical ponds, or clay-pits, which dry up entirely in hot weather, although the insects do not appear by any means to diminish in abundance in consequence.

On Parley Heath, in Hampshire, where dragon-flies are very plentiful, the numerous clay-pits to be met with there regularly become dry during nearly the whole of the summer.

What I should like to know therefore is what becomes of the dragon-fly larvæ and pupæ, which have not arrived at maturity when this state of things overtakes them, and also where are the ova deposited by those dragon-flies which have acquired the winged state, if there is no water to receive them ?

I can only surmise that the larvæ and pupæ, in the event of the drying-up of a pond, bury themselves in the mud, after the fashion of certain kinds of fishes in India, breathing by the same means, and returning again to activity on the occurrence of rain.

The ova, I conclude, are deposited on the surface of the mud, where they remain unhatched so long as the pond continues dry.

If the above should prove to be the correct solution, as I anticipate future research will show, it will be a very interesting point indeed in connection with the economy of these curious creatures. These insects, it should be remarked, require very little water wherein to dwell and undergo their metamorphoses.

An Afternoon among the Demoiselles and Agrions.

Among the many pleasant expeditions which I have undertaken in quest of dragon-flies, should be included one to Wixford, in Warwickshire, early in June 1891.

Leaving New Street Station, Birmingham, by train, just after two o'clock, I arrived at my destination, the little rural village of Wixford, punctually at half-past three. I had not far to go after getting out, for scarcely more than a minute's walk brought me to the river Arrow (a pretty tributary of the Avon), in the immediate vicinity of which I commenced operations at once.

Close to the bridge were a quantity of rushes and other aquatic plants, amongst which I soon saw a number of dragon-flies flying. The weather was remarkably fine, although rather windy, so that these beautiful insects, although exceedingly plentiful, were rather difficult to capture. I managed, however, in about half-an-hour's time, to secure a good series of the local *Platycnemis pennipes*, which was here in greater profusion than I had ever before met with it. In company with it were numerous examples of *Pyrrhosoma minium*, *Agrion puella*, and *Ischnura elegans*, several specimens of each of which I took for distribution among correspondents.

Proceeding to the other side of the river over the bridge, I went for some distance through flowery fields, as yet untouched by the scythe. Here I met with the beautiful blue-barred Demoiselle (*Calopteryx splendens*) in great abundance ; frequently half-a-dozen specimens, or more, could be seen flying all at once, and they presented a most pretty picture, with the sun shining upon their iridescent wings. They were particularly plentiful in a certain meadow by the riverside, where also a number of butterflies and day-flying moths were besporting themselves amid fragrant flowers, which abounded in every direction.

I may remark that I succeeded in taking a splendid series of specimens of these beautiful dragon-flies, which never fail to call forth a profusion of praise by all who come to view my collection.

After partaking of tea at a little old-fashioned straw-thatched cottage, I had a most pleasant walk through charming fields to Broom, thence on to Salford Priors, by the side of the river all the way.

Arriving at Salford at about 8 p.m., I had rather an unpleasant adventure with a bull, which chased me through a field near the junction of the river Arrow and the Avon ; but I sought a safe retreat in the churchyard close by, behind the palings of which I pelted the infuriated beast with pebbles. I made my way afterwards to the railway station, from an exit on the opposite side of the cemetery, arriving home at about 11 o'clock, tired in body but considerably refreshed in mind, after my half day's dragon-fly hunt.

(*To be continued.*)

ON NECTARIES.

By M.D. (Hawkshead, Ambleside).

Of all the various means employed by flowers to attract their insect friends, whether it be the brilliance of their colours, their size or singular shapes, the exhalation of sweet scents or peculiar odours, the massing of themselves, when singly insignificant into umbels, or heads, or racemes, in order to be more conspicuous by day, or arraying themselves in shining white, that they may be more easily seen by night, we can imagine nothing more likely to secure a host of eager visitants, than stores of honey, wherewith to reward them for services rendered. Some insects, it is true, are satisfied with pollen, a nitrogenous and highly nutritive food for such as they, and it is on the abundant supply of this commodity that many flowers depend, but by far the greater number offer something still more inviting, which we call nectar, after the ambrosial food of the gods on Mount Olympus ! Plants have their various organs set apart for the performance of special functions ; the root, the stem, the leaves have each their own important part to play, and when we come to the floral organs we find a similar division of labour, one set being told off to protect the rest when in bud, and perhaps to continue the same kind office to the fruit, another has to be just as bright and pretty as possible, and then we have what are called the essential organs, stamens and pistils, without whose mutual action neither fruit nor seed could be perfected.

Amongst the earliest flowers, if we accept the theory of evolutionary botanists, there existed no special receptacle or organ for producing honey, such as we call a nectary, nor perhaps was it needed, for why accumulate what might equally well be distilled hour by hour to meet the varying necessity, as is probably still done by umbellifers and similar flowers that expose their honey on a flat surface, free to all who choose to take it ? But in the gradual progress of changes, by means of which flowers and insects were mutually adapted to each other, the advantages of more deeply placed honey became, so to speak, apparent, and methods were devised for ensuring it, some flowers adopting one device, some another, and the variety of these devices is most interesting to trace. We naturally look to the flower for the nectary, because only by its being placed near to the essential organs, could insects be attracted to those parts where their visits would be of service. We also find that it, perhaps, occurs most frequently in close connection with the ovary, the very heart of the flower, towards which the current of life sets with regale their friends with the sweets, secreted by the yellow glands at the bases of their leaves, and, whatever may be said to the contrary, afford a triumphant proof that plants are not exclusively selfish and utilitarian, as we in our half-knowledge are sometimes apt to imagine! In some cases, as amongst

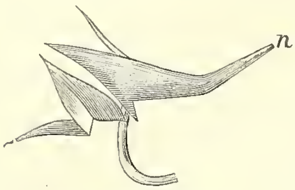


Fig. 20.—Tropœolum.

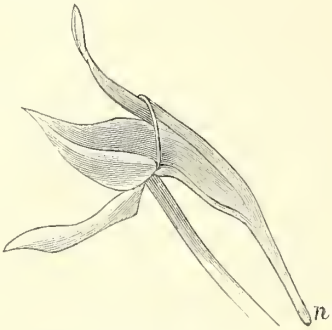


Fig. 21.—Nasturtium.

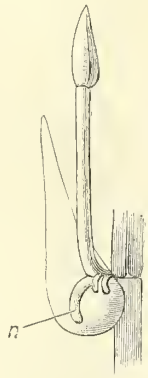


Fig. 22.—Arabis.

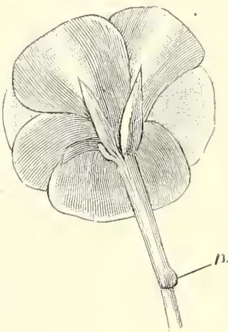


Fig. 23.—Geranium.

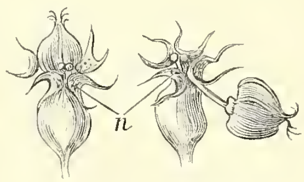


Fig. 24.—Spurge.

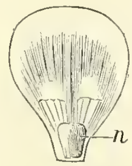


Fig. 25.—Buttercup.

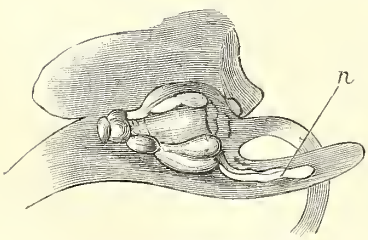


Fig. 26.—*Viola tricolor.*

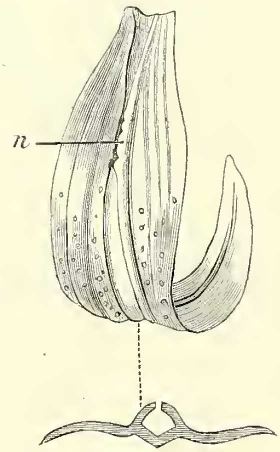


Fig. 27.—Garden Lily: *a*, entrance to nectary of Lily.

Fig. 28.—*Nemophila maculata.*

the fullest energy, and towards whose perfecting all the other parts of the plant continually strive. Still nectaries are in some instances found upon leaves, or what are to all intents and purposes nectaries, and it is always pleasant to hear the contented hum of the bees amongst the young laurel leaves, for with no ulterior ends of their own, the prosaic green bushes the lilies, nectaries are found upon the petals, but more frequently they are, as before stated, in immediate association with the central axis of the flower, especially with the base of the ovary, and stamens, but as there is no special provisions for a nectary in the theoretical idea of a flower, the adaptation of the various parts to serve the purpose, shows the resources and contrivances of our favourites in the happiest light.

There is an old proverb that speaks of "a good contriver being better than an early riser," expressing in a homely way the fact that fertility of resource and good management are sometimes more successful than industry not wisely directed. Be this as it may, it is both interesting and instructive to see how flowers have made the most of the means at their disposal, and in a variety of ways, according to their lights, have modified existing parts to allow nectar to be secreted or accumulated. Here a petal has been chosen to form a cup to hold it, there a stamen bears a flask of honey on its side, now a sepal is hollowed into a tiny bowl, or carved into a veritable horn of plenty brimming with sweets, and now the amber drops cover the disk like dew, or are even hidden away in little jars with lids to them to keep out the greedy ants! Just, however, as the flowers of a natural order or genus have certain characteristics in common, so their different species will usually secrete their honey more or less on the same lines, though with interesting individual differences. Our first natural order Ranunculaceæ seems to be an epitome of the possible adaptations of both sepals and petals to serve the purpose of secreting or storing honey. All the petals in Hellebore, and two each in Delphinium and Aconitum are transformed almost beyond recognition; and in the buttercup a little scale has been added to cover the honey-pit, a foreshadowing of the petaline nectary with a lid in Nigella. In Delphinium the coherent sepals of the spur share with the two dorsal spurred petals the work of distilling and forming a receptacle for the nectar, and in Caltha the disk or fleshy base of the ovary secretes the honey. No doubt exotic species

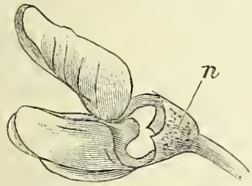


Fig. 29.—*Coronilla varia.*

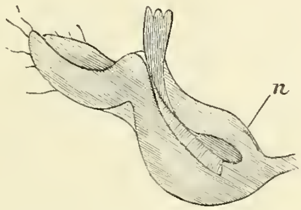


Fig. 30.—*Nigella Damascena.*

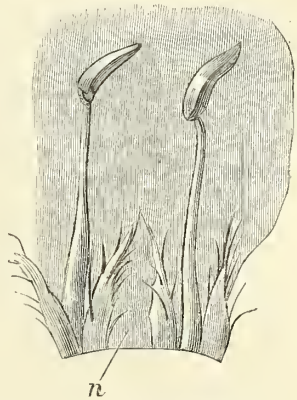


Fig. 31.—*Nemophila insignis.*

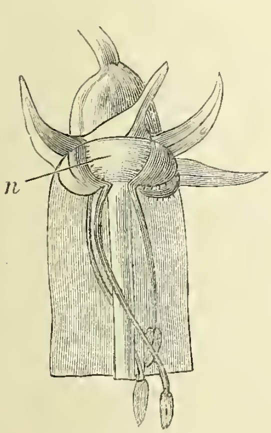


Fig. 32.—Harebell.

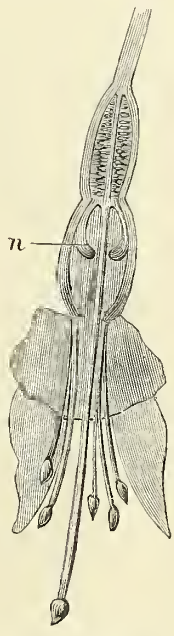


Fig. 33.—Fuchsia.

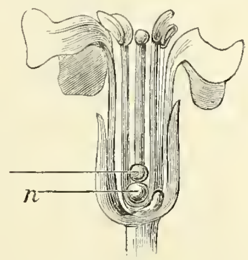


Fig. 34.—Radish.

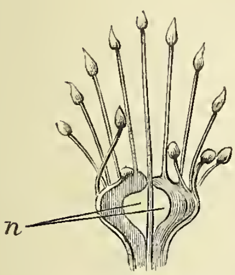


Fig. 35.—Parnassia.

Fig. 36.—Mignonette.

would furnish other examples. The umbelliferous order, with its somewhat monotonous flowers, contents itself with the simple plan of using its two-lobed fleshy disk as a nectary on which the honey lies fully exposed, and a contrast to this method is furnished by such flowers as Pinks, Honeysuckle, etc., which secrete their honey at the base of a long narrow tube where it can only be reached by bees and butterflies. Whether, however, the nectar be exposed or concealed, the nectary is rarely, if ever, represented by an independent organ, but one or other of the normal organs of the flower is modified to form it. It will perhaps be convenient to classify the following examples according to the part that is adapted to form the nectary, but such a classification cannot be rigidly adhered to, since frequently two different organs take part in its formation.

Sepaline Nectaries.

To begin with the outer whorls of the flower—a sepaline nectary frequently takes the form of a spur, which may be either a simple receptacle or may itself distil honey by means of special cells or glands at its tip. This latter kind of nectary may be seen in a species of Tropœolum, called in the north the Flame-flower, in the garden Nasturtium, and Impatiens (Figs. 20, 21) for in these three flowers the spur is formed by the union of two or more sepals, and is both the honey-maker and the honey-storer. In some of the Crucifers such as the common rock Arabis of our gardens (Fig. 22), two of the sepals are pouch-like and hold the honey distilled by the staminal glands, and in the Lime blossom the sweets that make the tree "a summer home of murmurous wings" are offered to its guests in the hollowed sepals of the flower. The functions of the curiously concealed spur of the Pelargonium are not equally clear, but it probably produces the honey that fills it, and which is only accessible by means of an elongated aperture behind the stamens and pistil. It seems specially adapted for bees and moths. In the Euphorbias, too, one cannot but admire the utilization of what was originally a calyx, or part of one, for the formation of most charming nectaries; for what are the functions of the involucral glands that surround the odd little flowers of *Euphorbia peplus* and its relatives, if not to distil and display honey? *Coronilla varia* (Fig. 29) secretes its nectar upon the outside of the calyx. Curious to relate, the honey is sought for in the ordinary way, for humble-bees and others alight upon the flower as on any other pea-flower, and passing the proboscis through the open space left by the long narrow claws of the standard and alæ, suck the honey from the calyx. The flowers being gathered into a compact head would be an additional protection in case the honey should be sought for in an improper manner.

Petaline Nectaries.

The so-called "spur" is sometimes formed by the petals, the Columbine being a flower that has fashioned its five petals into as many funnel-shaped vessels, tapering into long curved tips for the distillation of honey. The spur in the Violas (Fig. 26) is also petaline, but it is only a receptacle. An instance of a petaline nectary is afforded by the long slender spur of *Habenaria bifolia*, which is fertilized by nocturnal moths. But although the spur is a favourite idea for a nectary, it is by no means the only idea for those flowers who elect to use their petals for the purpose. In Eranthis and Hellebore we see them transformed into cups for holding nectar, and although in one sense the long tube in the honeysuckle and similar flowers cannot be designated a nectary, in another sense it deserves the name by right of the stores of honey it enables the flower to accumulate, and by its length, which renders them accessible only to the moths and butterflies, to whom it is specially adapted. In the Lily tribe we have another kind of nectary, very curious and interesting. It is a sort of tube with thick raised borders edged by papillæ, and occupies the centre of each of the perianth segments. A groove leads up to it and helps to direct the tongue of such insects as the hawk-moth, to whom alone the honey is accessible, and who in obtaining it must cling to the centre of the flower and thus effect fertilization. The drawing (Fig. 27) was made from a common orange lily. The honey is secreted by the base of the ovary. The three species of Nemophila grown in gardens have extremely pretty petaline nectaries; the idea in each is the same, but differently worked out. Those of *N. maculata* (Fig. 28), seen from above, have the appearance of little pockets fringed with long hairs, and it is only by inserting the proboscis into the cavity that the honey can be reached, as it is secreted by a ring at the base of the ovary. All the Nemophilas are rich in honey and are greatly visited by bees. The modification of the petals in Nigella (Fig. 30) is very curious, the cavities that hold the honey being closed by a sort of lid that can only be raised by an insect large enough to fertilize the flower. In the common Monkshood two of the petals are transformed into long claws hooded at the tip, which secrete honey in their innermost recesses, a groove in the claw serving as a guide to the insect's proboscis.

(To be continued.)

DICRANURA VINULA—THE PUSS MOTH.

HAVING been brought much into contact with this insect, I propose to give a short account of its life-history, which may prove interesting and instructive to those who have not had similar facilities of observing it in a state of nature; more especially as the life-history of this species applies more or less precisely to that of the other four members of this genus, to which the popular epithet of "kittens" is usually given on the frail and far-fetched basis that they are "like the puss, but smaller!"

The eggs of *D. vinula* are generally laid in batches of two together, but occasionally singly, and more rarely four or even five may be found on one leaf. They are always laid on the upper side of the leaf, and are usually of a red-brown colour, but are sometimes found all hues, ranging from the above red-brown to a creamy-white. At first I thought that the whitish variety was probably due to infertility, but subsequently discovered it to be invariably fertile, and, contrary to the observations of the zoologist's correspondent, mentioned in Newman's "British Moths," the young larvæ emerging from them in no way differing from the general—I may say invariable —type. The egg is rather a large one for the size of the imago. I have found it on various kinds of *Populus* and *Salix*, but by far more frequently on the former, as, for instance, *P. tremula*, *nigra*, *balsamifera*, and a species which, I believe, is not indigenous to this country, and grows very similarly to the "weeping willow," although not so tall. On this latter I have also taken the empty pupa-case of *Leucoma salicis*. The period of oviposition extends over a considerable length of time, commencing, provided the weather be normal, soon after the middle of May, and continuing till the end of June or beginning of July. The earliest eggs I have ever found were on the 13th of June, but since the ecdysis of the imago occurs about the 12th of May, and they pair almost immediately, eggs must be about by the 25th of May at the latest, and may be found throughout the remainder of that month, the whole of June, and beginning of July; the latest eggs I ever saw being July 9th, but at that late date they are almost invariably taken singly. The eggs are occasionally found on old dead leaves. It is *possible* that the parent moth may lay them there, but at the same time it is by far more *probable* that the leaf had become sere and shrivelled after being visited by the female insect. In this case, of course, the young larva is obliged to climb the stalk and find a fresh and more nutritious leaf, before partaking of any foreign food, except its empty egg-shell, which is invariably devoured as soon as vacated.

In searching for the egg, it is advisable to bear in mind that if there has been anything like a breeze in one direction for two or three days previously—and the longer the previous duration of the fixed wind, the greater one's chance of success—the ova will probably be on that side of the tree farthest and most sheltered from the wind. This is a natural hypothesis, and one which I have found, when practicable, almost invariable.

The larva of *D. vinula* is perhaps as interesting and curious a one as is to be found among our British representatives of the order Lepidoptera. When the little caterpillar first emerges from the egg, he is about five lines in length, black and dark purple in colour. The following is a description of him in all his skins, taken from life. The first segment (the head) is black and shiny; the second bears the first pair of legs and a pair of prominences, jagged at the tips, which stand out on each side of the head, strongly resembling the ears of a kitten, These "ears" I consider exceedingly interesting, as it is, in my opinion, in this stage, that the insect bears out its popular name more than at any other. It is curious that no authors of works on our Lepidoptera, —except Mr. Newman, who does not appear to attach much importance to it,—mention this peculiarity. The third segment bears the second pair of legs; the fourth, the third pair of legs and a very slight hump. The sevenih, eighth, ninth and tenth segments bear the four pairs of prolegs. The thirteenth segment bears the fifth pair of prolegs, which are, however, converted into two "horns" or tails, nearly a quarter of an inch in length, which are black, with yellowish threads, or *tentacula*, which protrude when the larva is irritated or startled. Just above these horns, almost on the back, as it were, is the anal orifice, and again above this is another pair of "exceedingly minute horns." The belly and lower half of the larva is of a very dark purple, the back and upper half being black.

The second skin differs little from the first, excepting in size and colour. The "ears" have increased, being now about a sixteenth of an inch long. The fourth segment has also developed considerably, now having a distinct and obvious hump; at the eleventh segment the larva commences to become thinner, gradually tapering off to the thirteenth segment, which is very small, and whence the horns spring. The horns in this skin are about half an inch in length, black mottled with yellow or red, but variable, with red threads, and the minute dorsal horns are still visible. The head is as above, black and shiny, and the ears still jagged at their ends. A strong black dorsal band extends from the ears to a point on the hump on the fourth segment, and thence widens to between the eighth and ninth segments, where it reaches to the lateral lines, and then runs in the shape of a half-moon to the eleventh segment, where it is about as broad as one of the "ears" is long. It then widens out again to the lateral lines near the tail, and ends on the minute dorsal horns before mentioned. The remainder of the body is yellow (or red when just "turned" from the first skin), with an exceedingly faint black lateral line and the dorsal line proper is indicated by the black being slightly darker along the centre of the back in a narrow line.

The third skin is almost exactly the same as the second, except, of course, that the larva has again increased in size, and is now five-eighths of an inch in length. The only other appreciable difference is that the broad black dorsal band now becomes brown from the head (inclusive) to the point formed by what the Rev. J. G. Wood calls the "St, Andrew's Cross," on the fourth, and also on the last segment. It is in changing from the third to the fourth skin that the larva experiences the greatest difficulty in its ecdysis, often being unable to throw off its old skin, especially when "stung," and consequently dying, foreign aid rarely being of any assistance.

In the fourth skin, the eighth segment is black all over, with just a little green above the prolegs; there is a minute black spot on the second segment with a white centre; the "ears," jagged, black to dark-brown; tails black, red just before the tips, with scarlet *tentacula*, legs black; head dark, shining black; there are also dashes of light-brown just above the legs on the seventh and ninth segments: the eleventh and twelfth segments are brown underneath, while the thirteenth segment is brown on each side of the belly. The larva in this skin is three-fourths of an inch in length, and the "ears" begin to disappear.

The fifth skin varies from the last only in that the black is darker generally, all the spiracles are black with a white centre, and that the green, which covers the whole of the body, except that occupied by the spiracles and dorsal area, is of a beautiful grass-green and remarkably pretty. The larva is now fourteen lines in length.

The sixth and last skin differs materially from its predecessors. The brown on the back becomes very light and most pleasantly mottled with white. The brown on the dorsal portion of the second segment, being quite greeny, appears to fade gently into the yellowish-green of the sides. The spiracles are of a vivid white surrounded by black; there is a white line between the brown of the dorsal and the green of the lateral, area. The hump on the fourth segment is reddish. The second segment is extended into prominences on each side of the head, in the place where the ears, which have now entirely disappeared, once were, giving the front of that metamere a square appearance, on which prominences are two black spots. The head is chestnut-brown, black at the sides, and decidedly smaller than the second segment, into the red "front" of which it may be withdrawn at the will of the larva, this being its natural position when at rest. The legs are yellow and black; the prolegs are green with black at the extremities; the tails are white and black, the black part being rough and scabrous; the dorsal tails are black; and the thirteenth segment is black above.

There appear to be, as far as my observation serves me, but six skins to this larva, although the last certainly varies considerably in accordance with its age, and also in different specimens. In some, the brown spot on the eighth segment is very small, *i.e.*, a very small patch of it, and in others the whole segment is completely covered. Some individuals are almost white or very light, whilst in others a great density of colouring is manifest. Again, when the skin is "young"—*i.e.*, only just changed—the top of the second segment is the same as the rest of the back, but when old it becomes harder and shinyer, or whiter, or again in other specimens, blacker. In some examples the head is brown nearly all over, whilst in others it has a broad black band along the top and sides; but it is always shiny.

The larva may be found from the beginning of June to the end of August, although rarely after the beginning of the latter month, as they then ascend the tree to a height of seven or eight feet, and, being almost wholly green (except the dorsal band, which may very easily be mistaken for the mid-rib of the leaf or for a twig by the uneducated eye) are very difficult to spot, and when "spotted" the leaf on which the specimen is feeding must be taken with it, for this insect possesses marvellous "powers of grip," as is ably set forth by Mr. E. A. Butler, in the December (1892) number of "Knowledge," where my readers will find a microscopical illustration of the hooks on the prolegs of *Smerinthus tiliæ* (the lime hawk-moth) magnified sixteen diameters, to which insect *D. vinula* bears a close relationship in this particular.

When the larva is about to become a pupa, it is exceedingly curious to note that, in common with the majority of other larvæ, it invariably emits a vermilion frass, and the bright grass-green of its lateral area turns to a dull, dirty, purplish-brown, harmonising beautifully with the colour of the trunk of the tree, down which it has to climb in order to select a suitable situation for its wintry abode. In confinement, it then becomes exceedingly restless, and if bark, etc., be not supplied it, will "spin up" among the dead leaves and frass, whence doubtless it would emerge in due course, having completed its pupa state, as fine an imago as though it were at large on the stately trunk of some lordly poplar, ancient willow, or water-loving sallow.

The chrysalis of *D. vinula* is rather small, compared with the size of the larva and imago, being about an inch and a quarter in length; of a claret colour, having the antennæ short and thick, the legs visible, and the eyes and very small proboscis prominent. The spiracles are very obvious, and the extremity of the body, or anal apex is rounded. Its ecdysis takes place on the trunks of those trees on which the larva has lived, viz., poplars, willows, and sallows, placed in the order of merit; but I have not noted that it affects the Lombardy poplar more than the aspen, as stated by Mr. Merrin in his "Lepidopterists' Calendar." When full-fed, the larva, as above described, changes in colour, and seeks some place in which it may be secure from the "stormy blast" of winter cold. Having found this, he at once begins to gnaw away the bark, and to bring it round in front of him, between himself and the outer air, mixing with it at the same time saliva of a glutinous nature, which when dry is exceedingly hard and stout; as the Rev. J. G. Wood says, "a strong knife is required to make any impression on it." This cocoon is not invariably situated *on* the bark; I have upon several occasions taken it under the bark of willows. When the cocoon is completed, it in no way differs from the remainder of the trunk, except that it bulges out a very little from the general surface, and usually being located in a slight hollow, even this becomes invisible. In this secure and novel retreat, on which storm, rain, and all natural influences, barring man, may fall ineffectually, the larva, having smoothed down all the walls and both ends, for the cocoon is cylindrical, undergoes its metamorphosis to the pupa during the middle or end of August, as almost all larvæ which hibernate as pupæ do not take more than a week to change; the latest date on which I have ever taken this larva is August the 15th. I have very often found the empty cocoons of this pupa on aspens, Lombardy poplars, and willows, together with those of *D. bifida*, *A. psi* and *megacephala*, but never have I found one with the living pupa inside, that having fallen to the lot of those energetic entomologists only, who spend most of their time, and half their lives in quest of such hidden secrets of Nature. It is also a remarkable fact when one does find the empty cocoon, there is rarely an empty pupa, or larva's skin inside; this is the more strange, since the moth, in escaping, makes but a very small hole through which to reach the light of day, and even then, often nearly fills this up with fur or scales. I can find in Nature no confirmation of the idea usually, I think, held by entomologists, that this cocoon is generally found from two to four feet from the ground. I have seen them five and a half feet, and have a specimen before me now, filled with the cocoons of some large ichneumon, which I took from *P. nigra* at least five feet eight from the ground, and have also taken others only just out of reach of toads, moles, etc., at the base of the trunk.

The imagines begin to emerge about the 12th of May, which is the earliest date on which I have found them. They were then bred from pupæ taken the preceding autumn. The moth emerges, as a general rule, between 8 a.m. and 1.30 p.m., but I have seen a specimen out at 6.0 a.m., with undeveloped wings, which, however, were normal by 8 a.m. The female lays nearly a hundred eggs, mostly, as previously stated, in ones and two, like those of *Smerinthus populi*. The eggs take from twelve to fifteen days to hatch out from the time of being laid. The wonderful way in which the imago similarizes itself to its surroundings, and becomes virtually invisible, is truly marvellous. I once put an ordinary-sized male into a box covered on the inside with newspaper, and when I went to look for the insect, I could find it nowhere for a considerable time, till at last my eye seemed to *catch* sight of it, or *notice* it, all of a sudden—there, in the centre of the box, right under my very nose sat that moth, as it were winking at me out of the corner of his eye (or rather those lenses which pointed directly in my direction)! I wasn't long getting the killing-bottle! Precisely the same thing occurs, when one is hunting for them on the trunks of trees, which is a thing I very rarely do, the larvæ being far more accessible—one seems to catch sight of them suddenly in just the same manner.

D. vinula is not attracted by light nearly so much as is generally supposed; in fact, only on four occasions have I taken it in such a position. The first of these was at Cowes, in the Isle of Wight, when one flew into the drawing-room about 8.30 p.m. in June, 1886; again, on Banstead Common, near Epsom, a female was taken in a room, who laid seventy or eighty eggs when placed in a large chip-box, in May, 1889. A third specimen was taken from a gas-lamp in Epsom, in 1890; and the last, a dead one, I found in a street-lamp at Peterboro', in 1891. I have not noted what position they take up when settled on the lamp; probably they madly gyrate round it for some considerable time and then settle down underneath or on the lower frame-work, like *P. palpina*, *C. cytherea*, and others.

Where I was enabled to carry on my closest observation of this most interesting insect was at Epsom in Surrey. Both the ova and caterpillars were numerous on aspen and Lombardy poplar; I have also met with it—sometimes, it is true, only with its empty cocoon—at Taunton, Brighton, and Cowes; but for the last year and a half, I have taken it in all its phases, in many localities on the east coast, from Goole in Yorkshire, to Ipswich in Suffolk, including Peterboro' (fairly common), Worlingham (rare), Geldston (common on willows), Woodbridge (common), Felixstowe (fairly common), and several other towns and villages.

The imago is so plentiful (usually, however, bred) that it calls for no description here, and I refer those requiring one, to turn to that given at page 214 of Newman's "British Moths," where a splendid figure is drawn, both in words and woodcuts. Suffice it to say, therefore, that the male is considerably smaller, from the time it spins up as a larva, throughout its pupa state, and as an imago, than the female; and that this insect, by no stress of imagination, having been once seen, can be mistaken for any other.

Careful as I have been to enumerate all the peculiarities in the life-history of this insect that I have had the pleasure of noticing, there is yet much to be filled in, principally theoretically; viz., the functions of the *tentacula*; why the last pair of prolegs are modified into tails—for I believe there is a reason for everything; what the object of emitting saliva from the mouth when irritated, and for what reason it is given off; why this moth, contrary to the habit of the majority of other moths, lays its ova on the upper side of the leaf; why the larva is humped on its fourth segment; in its early stages possesses "ears," and in its fifth and sixth stages, protrudes where the "ears" formerly were; what the reason for its constructing so excessively hard and wonderfully secret a cocoon—which obviously appertains to the doctrine of Mimicry; what the chemical or natural causes for its change of colour just before becoming a pupa; why it so closely resembles newspaper, as an imago—the silver birch (*Betula alba*) being the only tree-trunk which would afford it protection by mimicry in this respect, and the only species of this genus ever found on this tree, is *D. bicuspis*. When these and other similar questions are proved to be answered correctly, and will bear test, then, and not till then, may we consider the life-history of *Dicranura vinula* as complete.

CLAUDE MORLEY.

The Museum, Ipswich.

SCIENCE-GOSSIP.

IT is with much regret we have to record the death of Mr. H. T. Stainton, F.R.S. etc. The well-known author of "A Manual of British Butterflies and Moths," "The Natural History of the Tineina," "The Tineina of Southern Europe," "The Tineina of Syria and Asia Minor," "The Tineina of North America," "The Entomologist's Companion," and for many years the editor of the "Intelligencer," and "Entomologist's Annual." Mr. Stainton was among the first who thoroughly worked out that intricate and complex group of Natural History, the micro-lepidoptera, and there are few who had keener observation or greater powers of perseverance. He has several times been President of the Entomological Society of London, and an active member since 1848. Both the City of London, and South London Entomological Societies will greatly miss one of their best benefactors. The old saying that a man's works are not appreciated till he is gone from among us does not in this case hold good, for Mr. Stainton's "Manual of British Butterflies and Moths," has been a standard work since its publication in 1856. Mr. Stainton died suddenly early in December last, at the age of 70.

WE have much pleasure in calling attention to the "Child-Life Almanac," for 1893 (London: Geo. Philip and Son). It is loose-sheeted, each month's sheet separate, and crowded with valuable phenological and natural history observations.

A LINK between the present and past history of modern science has been snapped by the death, at the ripe old age of eighty-nine years, of Sir Richard Owen. He was better known to us in our younger days as Prof. Owen, and credited with the possession of an extraordinary amount of scientific knowledge. Thirty or forty years ago he was much in request as a scientific lecturer, especially on the comparative anatomy of fossil animals, and more than one eminent scientist among us owes his success in life to the infectious influences of Prof. Owen's early lectures. The doctrine of evolution never found in him a disciple; perhaps it came upon him too late in life, for very few men can recast their scientific philosophy after they are fifty years of age. But he was a grand old man for all that, and an honour to British science, which sent representatives from each of its learned societies to attend his burial in Ham churchyard on Friday, Dec. 23.

BEFORE the Chicago Exhibition opens, an event of enormous practical scientific importance will have taken place in America. Some weeks ago we gave our readers a description of the enormous engineering feat which has been going on for more than two years past, at Niagara Falls. This was, boring a tunnel through the rock from below the Falls to the rapids above. Practically tapping Niagara. The tunnel is now completed, and it is announced that the power-plant for transforming the energy thus supplied by the head of water into electricity will be in operation by March next. It is anticipated, that a current will thus be generated equivalent to 75,000 horse-power. This is an enormous supply, but a mere trifle compared with the mighty energy which wastes itself in tumbling over the Falls. No less a force than 45,000 electrical horse-power will be transmitted from the Niagara tunnel to the city of Buffalo many miles away, and 30,000 electrical horse-power will be conveyed to other places.

ON various recent occasions we have endeavoured to call attention to the use of electricity as a heating agent. Hitherto, we have thought of electricity chiefly as an illuminant. At a recent meeting of the Paris Academy of Science Mr. Henry Moissan gave a description of a new electrical furnace, which consists of two bricks of quick-lime, one upon the other, the lower one of which is provided with a longitudinal groove to carry two electrodes. Between them is a small cavity serving as a crucible, which contains a layer of several centimètres of the substance to be experimented upon. The latter may also be contained in a small carbon crucible. The highest temperature worked with it was 3000° C., produced by 450 amperes and 70 volts, consuming 50 horse-power. In the neighbourhood of 2500° lime, strontia, and magnesia crystallised in a few minutes. At 3000° the quick-lime composing the furnace began to run like water. At the same temperature the carbon rapidly reduced the oxide of calcium to the metallic state. The oxides of nickel, cobalt, manganese, and chromium were reduced in a few seconds, at 2500°; and a button of uranium, weighing 120 gr., was obtained from the oxide in ten minutes at 3000° C.

It is with much pleasure we have to announce that the Eastern Counties Coal-Boring Syndicate have received contributions to the amount of £2000, and that a first "Trial Boring" is not far distant.

No Hebrew prophet, not even Moses from the top of Pisgah, surveying and reporting upon the Promised Land he never entered himself, uttered a more trumpet-like sound of electrical prophecy than did Professor Preece, when he announced a few days ago that he had succeeded in sending, not a telegraphic message, but a *telephonic message*, from the shores of the Bristol Channel, where he experimented before, to the well-known island of Flatholm, three miles away from Cardiff, without the intervention of a connecting wire! Does this not suggest to our readers that Professor Preece may be playing with the ultra-microscopic pebbles of molecular physics after Sir Isaac Newton's plan?

There is some good work turned out at times, even from Cambridge University. Seldom is there any better than that produced in the Sedgwick Prize Essay. This was founded many years ago in honour of the grand old geologist whose name is still so familiarly reverenced amongst us. We would strongly recommend those of our young scientific readers who have been infected with a love for geology, to procure Mr. A. C. Seward's Prize Essay for the year just passed on "Fossil Plants as Tests of Climate."

The Cambridge Local Lectures Syndicate have just issued an announcement of their next summer meeting of University Extension Students, to be held at Cambridge in August, 1893. The programme is a large and varied one, and a number of well-known lecturers have already promised their services. Among the scientific lecturers we notice the names of Sir Robert Ball, Sir H. E. Roscoe, Mr. Pattison Muir, and several of the best known of the Cambridge Extension Lecturers. Cambridge has always laid great stress on the importance of providing, as far as possible, practical work in science as well as theoretical teaching. It has seldom been found possible to arrange much practical work in connection with the lectures given in the provinces, chiefly on account of the difficulty of finding laboratory accommodation. But students who can spare a fortnight, or better still a month, have now the opportunity of coming to Cambridge, and seeing, at any rate, something of the resources of the University laboratories. The laboratory work has always formed an important and highly appreciated part of the Cambridge Summer Meetings. Next summer, five practical courses are promised, viz. :—in Physics, Chemistry, Botany, Physiology, and Palæontology. It is also proposed to give a series of short courses of lectures on the growth of various sciences:—Astronomy, Physics, Chemistry, and Geology; to illustrate from different points of view the methods by which discoveries are actually made and science makes progress. The programme includes also lectures on History, Literature, Art, and other subjects; but we have dwelt only on the science, as being of special interest to our readers.

Late in November (the 23rd) Prof. Ed. Hull, F.R.S., etc., read a most interesting paper before the Geological Society, giving an outline of the geological features of Arabia Petræa and Palestine, which, as the President remarked, is mainly interesting as dealing with the geology of the Bible. We cordially recommend Bible students to read Prof. Hull's paper.

The (second edition of) "North Yorkshire," published in the Transactions of the Yorkshire Union, is devoted to "Studies of its Botany, Geology, Climate, and Physical Geography," contributed by the eminent naturalist Mr. J. G. Baker, F.R.S., F.L.S., etc. This part (the fifth instalment) deals with the flora of North Yorkshire from *Pyrola* to *Gesleria*.

The last number of the evergreen "Annals and Magazine of Natural History" (Taylor & Francis), publishes a paper by the Rev. O. P. Cambridge, on a "New Spider from Calcutta."

We have received another prospectus of Mr. Saville Kent's forthcoming new work on "The Great Barrier Reef of Australia," enclosing an exquisitely beautiful coloured plate of the Great Barrier Reef *Alcyonaria*. The work will be issued in parts, the first to appear early in 1893.

At a recent meeting of the Perthshire Society of Natural Science, a letter was read from Dr. F. Buchanan White, F.L.S., F.E.S., (late President of the Society), offering to present to the Perthshire Natural History Museum the whole of his collection of Lepidoptera. The collection is a valuable one, containing about twelve thousand specimens of Perthshire, British, and European moths and butterflies, all named and localised. Many are type specimens, described by Dr. White in various scientific publications, and some belong to species now extinct. The collection must be worth several hundred pounds. A very cordial vote of thanks was accorded to Dr. Buchanan White, for his generous gift. It is particularly opportune, as the Society was about to make an extensive addition to their Museum buildings.

In the last number of the "Kew Bulletin," (devoted to practical and ecomomic botany) we have a remarkable illustration of the influence of mankind upon local climates. In Africa, the country between the Nile and the Red Sea is notable for its general barrenness. It is a desert, and the effects of wandering in this region upon the minds of Englishmen are very depressing. But the "Bulletin" shows that this physical condition of things has very probably been brought about by human agency. This is largely proved by the names of localities. Thus, the Arabic names of the valleys are those denoting the names of trees, although now not a single tree is to be met with. But there is no doubt that these valleys abounded with arboreal vegetation twelve hundred years ago, about the period when the Arabs began to extend over these regions. The Arab and his camel have been the means of converting a wooded country into a waste, howling wilderness and desert, and also of bringing about the climatic changes following upon such a physical revolution. The camels ate the leaves and shoots of the trees, and the Arabs converted the trunks, branches, and roots into charcoal. Similar vegetable destruction, it is believed, has brought about the semi-desert-like physical appearance of Palestine, which is so strongly contrasted with the description of the country in the Old Testament as a land flowing with "milk and honey," and whose tribal wars show that it was capable of supporting thousands of horses, chariots, and horsemen.

On Friday, January 6th, the Rev. H. N. Hutchinson delivered a lecture before the members of the Geologist's Association (illustrated), on "An attempt to restore Extinct Monsters."

Another Christmas Day has gone, and the season once more brought up the subject of the "Star of Bethlehem." A good many astronomical speculations and suggestions have been made concerning this phenomenon, and only a month before Christmas Day, the second of two articles on the subject, by Mr. J. H. Stockwell, appeared in the "Astronomical Journal." His calculations are based chiefly upon the conjunctions of the planets. He thinks the appearance of the "Star of Bethlehem" may have been due to the conjunction of Jupiter and Venus. Three centuries ago the distinguished astronomer Kepler suggested that the bright star beheld by the Wise Men, was probably due to the conjunction of Jupiter and Saturn. Mr. Stockwell calculates that Jupiter and Venus on May 8, six years B.C., were very close together, and must have presented a striking and beautiful appearance. This was fifty days short of two years before the death of King Herod. He thinks, therefore, that Christ was born as early as May, in the year B.C. 6.

It is with much regret we have to announce the death of an old friend, and frequent contributor to Science-Gossip, in Mr. Thomas Davies, senior assistant in the Mineralogical Department of the British Museum. Many of our microscopical readers will remember gratefully the helpful aid of his early book on "Mounting," published a quarter of a century ago.

MICROSCOPY.

Pitted Ducts.—I had been seeking some suitable wood for that fascinating employment, "chip-carving," and had been recommended to get lime, or Kawri pine, or American bass-wood. I sent to a timber-merchant for specimens of all three. I knew that the Coniferæ were distinguished by "pitted ducts," and that Kawri pine was remarkable by having a double row of pits in its ducts. I made some sections and mounted them, and found that the lime had pitted ducts as well, only six or seven pits often in a row, and not merely single ones. Dr. Carpenter, in his book on the Microscope, sixth edition, p. 439, figures the pitted ducts of the "Italian reed;" thus other plants besides the Coniferæ possess these pitted ducts. If some of your able correspondents would favour us with a paper on "pitted ducts," it would be most interesting. I suppose that many woods may be distinguished, one from another, by these or similar ducts; the microscope has become a useful adjunct to trade. Even a list of woods, with pitted ducts, would be serviceable, and would make our cabinets more interesting.—*A. C. Smith.*

Washing-Bottle for Micro. Sections.—The accompanying sketch shows an arrangement for washing sections, which I have found to be an improvement upon Mr. Marsh's apparatus for the same purpose. Instead of drilling a hole in the side of the bottle for the overflow, I use a siphon through

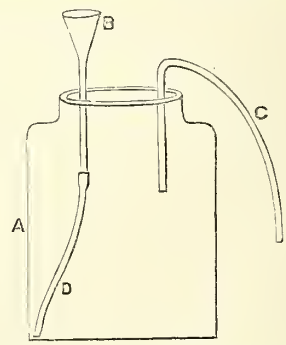


Fig. 37.—Washing-Bottle for Micro. Sections: A, bottle; B, funnel; C, siphon; D, india-rubber tubing connection from funnel to side of bottle at bottom.

the cork, which draws the water off at or near the centre, and does away almost, if not entirely, with the nuisance of a thin section being caught against the hole in the side, as often happened when using the apparatus as described in Mr. Marsh's "Section Cutting."—*C. W. Maw.*

New Slides.—We have received from Mr. C. W. Maw, Bradford, two excellently mounted slides of the Rhizome of Iris (v. sect.), showing *raphides* in situ; and one of the cuticle of the common onion, showing same objects.

The Royal Microscopical Society.—The December number of this valuable journal contains, in addition to the transactions and proceedings of the society, and a summary of current researches relating to zoology, botany, microscopy, etc., two exceedingly valuable papers, both of which are abundantly and highly artistically illustrated. The first is by Mr. William West, F.L.S., "On the Algæ of the English Lake District," dealing with about 589 species of desmids, of which sixty-four recently discovered forms are here illustrated. Mr. West has been assisted in the preparation of this paper by his son, Mr. G. S. West, national scholar in biology. Most of these interesting desmids appear to have been gathered from the numerous rock-tarns which occur about Brant Fell, Bowness. The second paper in this journal is by Mr. Frederick Chapman, continuing his careful researches into "Foraminifera of the Gault of Folkestone," and dealing with the sub-family of Textulariinæ. Mr. Chapman's paper is illustrated by two plates of exquisitely-drawn fossil Foraminiferæ of the Gault.

"Le Diatomiste."—It is with pleasure that we notice the December number of "Le Diatomiste," edited by M. Tempère, of Paris, and containing much valuable matter, chief among which is a clever article on "La culture artificielle de Diatomées," by Dr. Miquel, illustrated by a clearly-executed diagram. This number also contains papers on some new forms of Mastogloia, and on "Quelques Diatomes nouvelles ou peu connues," by Messrs. Cleve and Grove; also two very fine plates of Amphoræ and Mastogloiæ, which do great credit.

ZOOLOGY.

Sending Zoological Specimens by Post.—After many attempts, I have devised a simple way of sending small specimens by post, which may not be new, but cannot be very generally known. Take a small square piece of sheet cork, and cut out of it a smaller square piece, leaving a broad margin as here shown. Over one side of this gum (by the edges only) a piece of cardboard or paper. When this is firm,

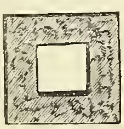
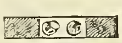


Fig. 38.

put the specimens in the tray thus formed, with a little tissue paper or cotton-wool; and then gum a similar piece over the other side. The resulting package in section is thus:  (Fig. 39). I have sent many such packages by post, with shells and insects, and in no case has anything been broken. Cork has an advantage over wood in being easily cut; and its lightness prevents the packets from making the letters overweight.—*T. D. A. Cockerell.*

Colias edusa.—The extreme south-eastern district of London was, last year, in company with most others, favoured with a visit of this beautiful butterfly. I was not very fortunate in capturing a great number, for I only took about a dozen specimens. Among them were five female Edusæ, and one splendid specimen of the rare helice. The last-named I took in a chalk-pit, at Charlton, on August 11th, where I met a boy who had captured another of them. The first Edusa that I saw was on May 31st, at the bottom of Greenwich Park. I saw another at Eltham, on 4th of June. I did not see any more before August the 8th, when I caught one at Chiselhurst, about seven miles from here. After that they were very common, and, apparently, not particular where they passed their time, being seen alike in back streets and clover-fields. I have not seen any since the 3rd of September. Can any one tell me the nearest haunt (to here) of the marbled white?—*Percy Oakeshott.*

BOTANY.

The Orobancheæ.—In the years 1889 and 1890, my father, Captain Haward, collected a good many specimens of two species of Orobanche, i.e. *O. minor* and *O. elatior*, on a large variety of plants. A few notes on these may perhaps prove interesting to some of your readers. Everyone of the fifteen or sixteen examples mentioned below, was found in the parish of Little Blakenham, near Ipswich. Taking *O. minor* first, this occurred on five plants in the order Leguminosæ, viz. *Medicago sativa*, *M. lupulina*, *Trifolium pratense*, *T. repens*, and *Onobrychis sativa.* It was only found on one plant among the Umbelliferæ, *Pastinaca sativa*, but it grew on no less than six flowers of the Compositæ. These were *Carduus nutans*, *C. arvensis*, *Picris hieracoides*, *Crepis virens*, *Leontodon hirtus*, and *Anthemis cotula.* *O. minor* had also attached itself to one Labiate plant, i.e. *Nepeta glechoma*, and to one grass, *Festuca ovina*, var. *rubra.* This species of orobanche is very common in the neighbourhood, generally affixing itself to the root of one of the clovers, or to *Crepis virens.* I have seen clover-fields quite brown in places from the abundance of *O. minor.* Of most of the other specimens in this list, only one example was found. Some of them were very small, and seemed to have had a hard struggle for existence, notably that on *F. ovina*, but the guest of a *cotula* was 18½ in. in height, and that on *C. nutans* was 24 in. Most of the works on Botany give *O. elatior* as being parasitic only on *Centaurea scabiosa*, I believe. This is certainly its most usual host-plant, and on scabiosa it grows abundantly round Blakenham, particularly in some of the chalk-pits there. My father, however, discovered it on two other flowers in the same order, but in each case there was only one specimen to be seen. The two plants were *Centaurea nigra* and *Knautia arvensis.* I should add that all these specimens are in our possession, mounted in such a way as to show their attachment to the plant they were living upon. Perchance some among your many subscribers may have seen one or other orobanche on different host-plants to those I have mentioned. If so, might I ask them to communicate the result of their observations to SCIENCE-GOSSIP, for it would certainly be very interesting to note how many flowers are "favoured" by these parasites?—*L. Creaghe-Haward, Bramford, Ipswich.*

THE EVERLASTING PEA AND ITS FICKLE COLOUR.—The note anent the everlasting pea by Mr. Edward A. Martin in the January number, p. 22, is eminently interesting to myself. Here at length is one mystery solved, one difficulty explained. During last summer, I was presented with a bunch of everlasting pea, which grew on the very wall of the very house wherein the late C. Darwin resided for some time, and I forthwith determined to scientifically examine the flowers for the first time. Having analysed them in the manner already described in the October number, I found that the result was decidedly eurious, not to say staggering. "These petals are red," I exclaimed, "but my experiment infallibly demonstrates that their true and original colour is blue. Nobody has ever seen a blue rose, or a blue dahlia, but if somebody doesn't see, or hasn't seen a blue pea, then I'm a duffer." Meanwhile, I took a note of the contradictory circumstance; and judge of my delight, when on opening this month's SCIENCE-GOSSIP, I read the remarkable words, "the highly-coloured flowers gradually changed in colour, to a pale chalk-blue; nor was the colour one which gave the impression as of a fading flower; it was as though the adopted colour was the natural and original one." This last clause is prophetic; but it now turns out to be absolutely correct. The natural colour of this pea is a pure blue; a volatile acid emitted somewhere from its rich leguminous treasury of constituents, has, pro tem. as it were, turned to crimson.—*P. Q. Keegan.*

SILLGREEN.—The late Richard Jefferies, in one of the chapters in the recently-published volume, "Toilers of the Field," speaks of a plant called "Sillgreen." The name is unknown to me, and I cannot find the word in the "Encyclopædic Dictionary." It is, probably, provincial and local. Can any of your readers enlighten me as to the plant referred to? The passage in which the name occurs is as follows: "The dull tint of the thatch is relieved here and there by great patches of sillgreen, which is religiously preserved as a good herb, though the exact ailments for which it is 'good' are often forgotten." The common house-leek may be intended, and "sillgreen" may be a corruption of "seagreen," by which name it is sometimes known. But as no botanical authority with which I am acquainted gives the former, I should be glad of fuller information on the point.—*J. Halsey.*

GEOLOGY.

FOSSIL MYRIAPOD IN FOREST OF DEAN.—I note the occurrence of a fossil myriapod, in the coal measures, Forest of Dean, in an insect bed discovered by me near Cinderford. This is the first that has been discovered in that coal-field.—*T. Stock.*

A NEW FOSSIL FISH-BED IN WARWICKSHIRE.—The Rev. P. B. Brodie recently described a new discovery of fossil fish remains. The vertebrate remains occur in a very thin band of marly friable sandstone lying between two beds of green marl, though in some places the same bed has itself no admixture of sandy material. Bones and teeth are so numerous that it might almost be called a bone-bed. It does not exceed three inches in thickness. It contains ichthyodorulites of Cestraciont fishes, abundant palatal teeth of *Acrodus keuperinus*, ganoid fish-scales and abundant broken bones, some of which may belong to fishes, others to labyrinthodonts, and amongst the latter a fragment of a cranial bone. In the discussion which followed, Mr. J. W. Davis congratulated the author on the discovery of another horizon containing the remains of fossil fishes and labyrinthodonts. In the Keuper strata of Yorkshire no such beds had yet been discovered, and this addition was peculiarly interesting, on account of its rarity. Only a short time ago the *Semionotus* was discovered in the beds a little higher in the series; and it was a great pleasure to find that Mr. Brodie still retained his love for field-work, and was able to bring the results of his observations before the Society.

SCANDINAVIAN BOULDERS AT CROMER.—Mr. Victor Madsen, recorded at a recent meeting of the Geol. Soe., that during a visit to Cromer in 1891, he devoted attention to a search for Scandinavian boulders, and obtained three specimens: one (a violet felspar-porphyry) was from the shore, and the other two were from the collection of Mr. Savin. The first was considered to come from S.E. Norway, and indeed Mr. K. O. Björlykke, refers it to the environs of Christiania. He considered that the two specimens presented to him by Mr. Savin, who had taken them out of Boulder Clay between Cromer and Overstrand, were from Dalecarlia; and these were submitted to Mr. E. Svedmark, who compared one of them (a brown felspar-hornblende-porphyry) with the Grönklitt porphyry in the parish of Orsa, and declared that the other (a blackish felsite-porphyry) might also be from Dalecarlia.

NOTES AND QUERIES.

MICRO-FUNGI.—Mr. J. W. Walker is himself hardly "up to date" in saying the last edition of Dr. Cooke's little work on "Rust, Smut, and Mildew," bears the imprint of 1878. The fifth edition, "revised and enlarged," was issued in 1886. Still there is room for improvement, and another edition, containing the full results of the large body of workers on this subject, would meet a desideratum. *Æcidium orobi*, restricted by Dr. Cooke to Scotland, I found here in a wood last summer, while *Æcidium primulæ*, marked "not common," rendered the leaves of the primrose so conspicuous, that I could not withstand the temptation to write a special note about it for the Royal Cornwall Polytechnic Society. It abounded in all parts of the valley, particularly in damp woods and sheltered hedgerows. Outside the valley it was not so generally prevalent.—*Fred. K. Davey, Pousanooth, Perranwell Station, Cornwall.*

ACICULA LINEATA, VAR. ALBA, Jeff.—It may interest J. W. D. K. and others, to know that I collected my specimens of this rare mollusk at Fleetwood on July 26th and September 14th, 1890. On the latter date Mr. Standen of Manchester, who accompanied me, found three specimens. ("Journal of Conchology, vol. vi. No. 5.") It was also discovered in considerable numbers by Dr. G. W. Chaster of Southport, in Merionethshire in June last, ("J. of C., vol. vii. No. 3.") The late J. G. Jefferies also recorded it from the rejectamenta of the River Avon, near Bristol.—*W. H. Heathcote, M.C.S., Preston.*

THE *Llangollen Advertiser* states that a corncrake was caught in the neighbourhood of Pentrefelin, Llangollen, the second week in December. As it is a bird of passage, and seen in Great Britain during the summer months only, the capture is a remarkable one. Several local naturalists have seen the bird, and all without exception declare it to be a corncrake.

IT is rather a rare occurrence to find a thrush's nest in December; yet one with four newly-laid eggs therein was found, on the 8th, in Mr. Oxenham's linhay, in Spring-gardens, Wiveliscombe, Bristol.

A WASP'S STING.—A curious case, the result of a wasp's sting came under my notice at St. Bartholomew's Hospital last month (November). A woman was admitted with a swelling just above her ankle about double the size of a walnut. Her story was, that six months ago a wasp stung her, the leg got very swollen and in a fortnight began to ulcerate, the ulceration extending for about an inch round the point stung. Six weeks after this a swelling appeared in the centre of the ulcer, which steadily increased in size. The tumour was growing very rapidly when she entered the hospital. It was found to be malignant (Sarcoma) and an operation was at once performed for its removal.—*J. C. Padwick.*

SUPERSTITION REGARDING THE FLOWERS AND FRUIT OF THE APPLE-TREE.—Possibly some of your readers may be interested to hear of a curious superstition in the West of England, about the simultaneous appearance of flower and fruit on the apple-tree being a bad omen. Many years ago, when visiting an almshouse in a Gloucestershire village, an old woman said to me with reference to a sudden death by a fall from a horse in the family of a neighbouring farmer: "Martha and me, we says, when we saw a big white apple-blossom on the bough with ripe fruit in Farmer S——'s orchard last year, There'll be a death in the family as owns that tree before long." "Martha" was another old almshousewoman. What is the origin of this idea, I have not been able to find out, but have embodied it in a short village tale. Perhaps some of your readers may know more about it than I do.—*F. S. H.*

SPIDERS IN WINTER.—On the morning of December 28th last, after a very cold night (thermometer 19° F.), on going out I was surprised to see every door, wall, and possible place where a spider's web could hang thickly hung with cobwebs, thousands in every direction. On going into the town (Hemel Hempstead), the same again, shops, signboards, and eaves of all sorts similarly decorated; and walls as though covered with lace, and gas lamps festooned. On examining a large number of webs, no trace of a fly could be detected in any, nor were they torn by the entrance and escape of one. I write to put the question to your scientific readers, What possible object could the spiders have had in spreading their webs at a time when no fly could have been on the wing?—*B. P.*

OROBANCHE ELATIOR.—In the December number of SCIENCE-GOSSIP, I am made to say, that I know no other place in the "country" but Smeeten, Leicestershire, in which *Orobanche elatior* grows. This should read "in the county." I find that I forgot to mention, in speaking of the appearance of *Nasturtium officinale* at Wherstead, that the plant had grown many years before, in a brook which ran into the pond, which was cleaned out, but that the brook had disappeared, and no water-cress had made its appearance, at any rate for a long while in the pond. The apparent inference is, that the seed must have lain dormant during that period.—*L. Creaghe-Haward, Bramford, Ipswich.*

WASP SEEN AT CHRISTMAS.—On December 26th last, I was on the top of Thorpe Cloud in Dovedale, and was much surprised to see a wasp flying about in the sunshine.—*John E. Nowas.*

CAN anyone recommend me an inexpensive dictionary which includes common scientific words, constantly used in popular science works, but not given in common dictionaries? Is "Annandale's Concise English Dictionary" (Blackie & Sons), such as I want?—*F. P.*

[Editorial: Cassell's 3*s*. 6*d*. Dictionary is good.]

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

J. B. W.—You cannot do better than procure Dr. Cook's book, price 5*s*., one of the volumes of the "International Scientific Series," entitled "An Introduction to Freshwater Algæ," with an enumeration of all the British species. It is illustrated by thirteen plates, with all the details of the species, beautifully drawn, amounting to one hundred and twenty in number.

T. B. G.—No; the mineral is evidently a piece of green Fluor-spar, commonest found in this country in the lead-mines about Alston Moor.

T. W. S.—"Notes on Collecting and Preserving Natural History Objects," edited by the present editor of Science-Gossip, was first published by Messrs. Hardwicke and Bogue in 1876. It was contributed to by twelve of the most distinguished practical naturalists of the time, in the several departments of scientific work that were known, in addition to the introductory essay by the editor on "Geological Specimens." The latest edition, we believe, was published by Messrs. W. H. Allen & Co., Waterloo Place, Pall Mall, to whom please apply for copies, price 3*s*. 6*d*.

F. G. A.—The specimens you sent us were very much decomposed. They were evidently those of the fungus *Peziza aurantium*, or orange-coloured Peziza. It is one of the largest species of the genus, and if properly taken up with the turf in which you found it, will keep for a fortnight underneath a glass-shade.

F. P.—Consult the prefatory essay on "The Geology of Suffolk," as to the best existing collecting-grounds for crag fossils. Nearly all the old pits and sections are now closed, since coprolite working ceased to pay.

EXCHANGES.

Wanted, marine telescope, or offer for twenty-six numbers of "Cassell's Technical Educator," unbound.—A. E. Arnot, 12 Elmswood Road, Seacombe, Cheshire.

Wanted, a good head, with antlers, of the Irish elk.—T. Stock, 16 Glen Park, Eastville, Bristol.

Wanted, Nyman's "Conspectus Fl. Europ.," Gray's "Synoptical Flora of N. America," vol. i., part i., "Flora of Russia," and flora of almost any country. Offered, Cassell's "Natural History" (complete), Cassell's "Familiar Wild Flowers," Nos. 5 to 40, Dickens' works (complete), Smith's "English Flora" (complete), "Bibliotheca Piscatoria," "My Life as an Angler" (Henderson), Pratt's Flowering Plants of Great Britain," Smiles' "Men of Invention and Industry."

Lepidoptera from Sierra Leone for exchange (including many fine charaxes), set, and in papers; also insects of other orders, and some land-shells—achatinæ and subulinæ. Wanted, foreign rhopalocera, especially charaxes, or lantern-slides of natural history objects. — W. G. Clements, Frindsbury, Rochester.

Well-mounted slides of foraminifera from the West Coast of Ireland, for any good mounting material.—John Butterworth, 120 Rochdale Road, Shaw, near Oldham.

Will sell or exchange, herbarium of micro. fungi containing nearly all the British uredines, puccinnias, etc. Accepted offers only answered.—Hilderic Friend, 4 The Grove, Idle.

For sale, pamphlet on "British Tree and Earthworms—about twenty copies only—2s each, post free. Tubes of British earthworms as catalogued in this issue.—Hilderic Friend, Idle, Bradford.

Wanted, Huxley's "Biology," Geikie's "Text-Book of Geology," Lyell's "Element's of Geology," and good microscope. Various books offered in exchange. State wants.—Rowland, 32 Essex Road, Acton, W.

I shall be pleased to receive communications from anyone interested in natural history, who would be willing to cooperate in forming a local natural history club or society, or from those who would join such a society if one were formed.—A. V. Mitchell, 11 Crozier Road, Mutley, Plymouth.

To microscopists. I will send tubes of living specimens of *Hydra viridis*, *Volvox globator*, and *Conochilus volvox*, in exchange for microscopic slides, more particularly those dealing with insects noxious to vegetation.—Fred. H. Davey, Ponsanooth, Perranwell Station, Cornwall.

Offered, *Xylophaga dorsalis*. Wanted, *Terebratula cranium*, *Pecten striatus*, *Nucula sulcata*, *Cardium aculeatum*, *Venus striatula*, *Psammobia costulata*, *Donax politus*, *Lutraria oblonga*, *Scalaria Trevelyana*, *Natica Islandica*, *Buccinum Humphreysianum*, *Trophon muricatus*, *Nassa nitida*, *Mytilus Galloprovincialis*, *M. ungulata*. *Galeomma Turtoni*.—J. Smith, Monkredding, Kilwinning.

Wanted, a good marine dredge, also a set of sieves for marine biological work.—W. Harcourt Bath, 195 Ladywood Road, Birmingham.

Offered, 2⅔-in. achromatic object-glass, by Slugg, Manchester, in cell. Wanted, electrical or microscopical appliances, or books.—G. Banks, 24 Avenue Villas, Cricklewood, N.W.

Wanted, handsome foreign shells, particularly of following genera: conus, cypræa, nietra, voluta, alina, and harpa. Offered, natural history books and specimens.—W. Harcourt Bath, 195 Ladywood Road, Birmingham.

Morris's "British Fossils" (1854); Murchison's "Siluria" (1854); Emmon's "American Geology" (1854); "Memoirs of Geological Survey, (1849–61;" S. Wood's "Crag Mollusca" (1848); Parker and Brady's "Crag Foraminifera" (1886), and other similar works offered in exchange for desirable land and freshwater shells.—Miss Linter, Arragon Close, Twickenham.

Wanted, vols. of "Naturalists' World," "Research," and Science-Gossip, in exchange for other books.—J. H. Lofthouse, 42 Mayfield Grove, Harrogate.

Offered, *Scalaria clathratula*, *Odostomia interstincta*, *Lachesis minima*, *Barleeia rubra*, *Odostomia spiralis*, *Rissoa punctura*, *R. cancellata*, *R. striata*, *R. semistriata*, *R. costata*, *Calyptræa sinensis*, *Helcion pellucidum*, *Eulima bilineata*, *E. polita*, *E. distorta*, *Tectura testudinalis*, and other shells, in exchange for good and rare micro. mounts, preserved curios, trilobites, or other rare shells, &c.—T. E. Sclater, Natural History Stores, Teignmouth.

What offers for vols. i. and ii. of "Health"?—P. Oakeshott, 62 Greenwich Road, S.E.

Will exchange four years of the "Entomologist," from 1889 to 1892. What offers?—A. S. Cook, 31 Lower Road, Rotherhithe, S.E.

"Field Club," vol. i. (bound), and vol. ii. (unbound); Science-Gossip, Nos. 300–312 (unbound); "Boys' Own Annual," vols. vi., xi., and xii. What offers in carboniferous ossils or books? Apply to—B. T. Bonser, 29 Highbury New Park, N.

Wanted, botanical slides in exchange for named foraminifera.—Miss M. J. Harris, 42 St. Brannock's Road, Ilfracombe.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Electrical Experiments: A Manual of Instructive Amusements," by G. E. Bonney (London: Whittaker & Co.).—"Arcana in the Ruenzora; or, Treasures in Uganda" (London: Elliot Stock).—"Journal of the Field Naturalists' Club."—"Manual of Syllabic Shorthand," by James Simson (London: Elliot Stock).—"The Field Club" (London: Elliot Stock).—"Journal of the Royal Microscopical Society" (London and Edinburgh: Williams & Norgate).—"The Microscope," by Dr. Henri Van Heurck, English edition translated by Wynne E. Baxter, F.R.M.S., F.G.S. (London: Crosby, Lockwood & Son).—"The Naturalists' Journal" (London: W. Longley).—"North Yorkshire," by John Gilbert Baker, F.R.S., etc. (Leeds: Taylor Bros.).—"Le Diatomiste" (Imp. de Colombes. F. Le Nindre, 41 Avenue de Gennevilliers).—"Canadian Naturalist."—"The Naturalist" (London: Lovell Reeve & Co.).—"The Microscope" (Washington: The Microscopical Publishing Co.).—"The American Monthly Microscpical Journal" (Washington: Chas. W. Smiley).—"The Journal of Conchology" (Leeds: Taylor Bros.).—"Nature Notes" (London: John Bale & Sons).—"Feuilles des Jeunes Naturalistes."—"The Botanical Gazette" (Bloomington, Indiana).—"The Annals and Magazine of Natural History" (London: Taylor & Francis).—"The Idler" (London: Chatto & Windus).—"Natural Science" (London and New York: Macmillan & Co.).—"The Mechanics of Daily Life," by V. Perronet Sells, M.A.F.C.S. (London: Methuen & Co.).—"Annals of British Geology, 1891," by J. F. Blake (London: Dulau & Co.).—"Electrical Experiments," by G. E. Bonney (London: Whittaker & Co.).—"Natural Science,"—"The Entomologists' Record and Journal of Variations," by J. W. Sutt, F.E.S.—"A Manual of Structural Botany," by M. C. Cooke (London: W. H. Allen).—"English Botany," Supplement to the Third Edition, by N. E. Brown (London: George Bell & Sons).—"The Victorian Naturalist," vol ix., No. 8.—"Proceedings of the Suffolk Institute of Archæology and Natural History," vol. viii., part 1.—"On the Alleged Proofs of Submergence," by Dugald Bell.—"On a glacial Mound in Glen Fruin, Dumbartonshire."—"The Naturalists' Journal," vol. i., No. 7, etc., etc.

Communications received up to the 10th ult. from: M. E. H.—G. W. R., jun.—P. O.—W. H. A. & Co.—J. E. S. J. H. C.—A. C. S.—G. C.—J. H.—L. M. H.—J. H. A. H.—C. W. F. T.—Lady B.—J. E. N.—B. T. B.—A. S. C.—W. A. K.—W. H. B.—A. H. S.—A. B.—H. F.—C. B. N.—F. S. W.—P. L. S.—J. C. P.—H. D.—T. S.—C. W. M.—Mrs. A. E. A.—J. H.—J. B.—C. and H.—R. H.—B. P.—P. D. A. C.—W. G. C.—J. R. L.—A. S. C.—J. R. H.—P. L. S.—J. E. L.—A. M. E.—F. B. P.—T. G. H.—Capt. W.—J. H.—G. W. R.—Dr. P. Q. R.—L. C. H.—Dr. A. M. E.—P. L. S.—W. H. B.—H. R.—J. S.—F. H. D.—R. G.—M. J. H.—G. P. & Son.—A. U. M.—J. H. A. H.—F. P.—S. C.—A. A. S.—E. R. S.—S L. H.—T. S. J.—A. W.—J. H. H.—A. W. W.—T. S.—F. W.—S. S.—T. B. S.—R. W. W. T.—P. B.—J. E. T.—Mrs. M. D.—T. D. A.—B. P.—Dr. R. H.—M. B. S.—Sir John T. G.—M. S.—R. F. A.—Dr. R.—General T. O. S.—M. A. S. S.—P. A. S.—M. L. H.—etc. etc.,

ON MOVEMENTS OF THE POLLINIA OF EXOTIC ORCHIDS.

By J. H. A. HICKS, F.R.H.S.

THE pollen-granules in orchids are massed together, and kept in that condition by minute highly-elastic threads, which becoming confluent at the base, form the caudicle, or supporting stem of the pollinium. Each pollinium is protected by, and kept within, the anther-case. The caudicle is attached to a very small membrane, the pedicel, variously shaped in the different genera; and on the under side of the pedicel, a gland, or disc, is found, which secretes a viscid fluid. The gland, or disc, is inserted into the rostellum, or superior sterile stigma, which has in some orchid-flowers become so extraordinarily modified, that it is difficult to reconcile it to its primordial condition.

In flowers of *Cattleya crispa*, the rostellum is broad and tongue-like, arching over the stigma, and the inferior surface consists of a coating of viscid matter. The pollinia consists of eight waxy clubs of pollen, attached to a confluent bundle of minute elastic fibres, forming the caudicles. The pollen is of two kinds, namely, waxy masses, and distinct compound granules. An insect, after obtaining nectar from the nectary, and in the act of making egress, strikes against the under part of the rostellum, which then turns upward, and the viscid matter being freely forced up all round, secures the lower end of the caudicles to the retreating insect. Without the aid of insects, or some intruding body, the sticky matter does not come in contact with the free end of the caudicles, and fertilization can therefore not take place.

In *Epidendrium floribundum* the upper and lower surfaces, when touched, resolve into a viscid mass; and the rostellum, with pollinia, is removed as soon as the nectar-seeking insect retreats, or an inserted object is withdrawn.

Both surfaces of the rostellum of *Bulbophyllum coccinum* also resolve into sticky matter, and must be forced upwards into the anther by mechanical aid, in order to secure the pollinia.

The pollen-masses in the Cypripedium section are converted into viscid matter, and the stigmatic surface does not exhibit any signs of viscidity, as is usual in many orchids, but is perfectly dry, more or less protuberant and convex, studded with papillæ. The pollen-masses possess no caudicles, and there is no rostellum present. Self-fertilization cannot take place, for the fertile anthers are so far removed behind and above the inferior surface of the stigma, that they cannot possibly come in contact with the stigma to effect fertilization; consequently in a state of nature they are entirely dependent on the removal of their pollen-masses by insect visitors.

In *Dendrobium chrysanthum* the pollen-masses possess no caudicles; but an insect, in endeavouring to retreat from the nectary, must knock against the lip of the anther projecting over the rostellum; consequently the lip is raised, and the viscid matter of the rostellum spreads into the anther, and the result is the pollen-masses are stuck to and carried away by the insect visitor.

In *Cœlogyne cristata* the caudicles of the pollinia are free, and the viscid matter cannot come in contact with them only by the agency of insects. This is also the case with *Sophronitis grandiflora*, *Lælia cinnabarina*, *Chysis aurea*, *Phajus grandifolius*, and *Phajus Wallissii.*

In *Oncidium grande*, *Brassia maculata*, and *Sobralia macrantha*, the caudicles to which the pollen-masses are attached lie within a cleft between the masses, more or less invisible, and attached at the lower ends to a curved pedicel, which is connected with the gland, varying in shape and size, and viscid on its inferior surface.

The pedicel, in many orchid flowers, is highly elastic and exceedingly sensitive; and the sensibility of the pedicel causes the pollinia to undergo the curious movement of depression, which is essential to secure fertilization.

When a suitable insect alights on the lip or labellum of the flower, it at once proceeds to insert its head into the stigmatic chamber, in order to obtain the nectar contained in the nectary with its proboscis; in so doing the head strikes against the rostellum, with just sufficient force to rupture its outer membrane in a transverse line; when this is effected, the anterior part of the rostellum is easily depressed, and the viscid gland, or disc, becoming exposed, cannot fail to touch and adhere to the head of the insect; so, when the insect withdraws, the pollinia, or pollinium, is also withdrawn, and the viscid matter of the gland soon becoming dry, firmly adheres to the head of the insect. Then the pedicel to which the caudicle is attached contracts, and causes the pollinium to become depressed, by which movement the pollen-packets are then so adjusted as to effectually strike the stigma when the insect next visits a similar flower,

The movement of depression is completed in *Odontoglossum triumphans* and *Odontoglossum vexillarium cobbianum*, in twenty seconds; in *Brassia maculata*, *Vanda teres*, *Stanhopea tigrina*, *Maxillaria grandiflora*, *Ærides odoratum*, *Oncidium grande*, and *Saccolabium blumei majus*, in about thirty seconds, while in *Rodriguezia suaveolens*, the movement is completed in about four hours.

The pollinium in *Acropera loddigesii*, after removal from the anther, undergoes the movement of depression; but in this case, Darwin considers the movement superfluous, "for the stigmatic cavity lies high up at the base of the rectangularly-projecting rostellum." The viscid matter of the disc in *Sarcanthus teritifolius*, *Odontoglossum triumphans*, and *Odontoglossum Oërstedii*, sets hard after removal, in about two minutes; while in *Lycaste Skinnerii*, and *Chysis aurea*, it takes thirty minutes to become perfectly dry.

Dr. Darwin, in his highly-interesting and valuable work on "orchids" (many of whose experiments and observations on orchid flowers I can fully confirm, having spent much time in making similar experiments and observations), says: "The discs and pedicels of the pollinia present great diversities in shape, and an apparently exhaustless number of adaptations. Even in species of the same genus, as in Oncidium, these parts differ greatly." Probably, the great diversity in shape and size, exhibited by the discs and pedicels, may be partially co-related to the certain parts of those insects which visit the flowers in a state of nature.

In flowers of *Catasetum saccatum*, the discs are very large and viscid. An insect visiting one of these flowers does not approach the discs, but, alighting on the conspicuous and convenient labellum, must unavoidably touch one of the two highly-irritable curved antenna-like prolongations. This movement instantly ruptures the delicate membrane, retaining the pedicel in a state of tension, and effects the expulsion of the pollinia, which curious enough is sure to strike and adhere to the head of the intruder; the insect being startled by the blow, at once flies off. Should this insect visit a female plant, the pollinia, now adjusted to a proper position through the elasticity of the pedicel, cannot fail to come in contact with the viscid stigma, and consequently fertilization takes place.

In *Calanthe dominii* the disc is oval and viscid, but is destitute of a pedicel. To this disc eight radiating club-like masses of pollen are attached by extremely short caudicles. The pollinia do not undergo the usual movement of depression. For an insect having visited one flower and secured the disc, would, on entering the nectary of another flower, bring the appended pollinia in contact with the lower part of the rostellum, thus causing the pollinia to curve down and strike the viscid stigma. Occasionally some of the central pollen masses are inserted through the opening in the rostellum, and adhere to the viscid rim of stigmatic tissue.

In *Ærides odoratum*, we have an example of the great elasticity of the pedicel. It is secured at its lower extremity by the disc, and at its upper extremity by the anther. If the disc is removed by some intruding object, the pedicel immediately springs up, thus liberating the pollinium from the anther-case. When this is completed, another movement takes place, by which the pedicel is restored again to the original position it held in relation to the disc while attached to the rostellum. This second movement is hygrometric, for when the pollinium, after removal, is placed in water, it moves back to precisely the same position it previously held, consequent on the elasticity of the pedicel; but, when removed from the water, the act of depression again takes place.

The flowers of *Oncidium ornithorhyncum*, afford another curious example of the hygrometric movement of the pedicel. Should an insect visiting one of the flowers remove the elongated pedicel from the rostellum, the pedicel becomes shorter, by moving backwards upon itself. The stigma being shallow, this movement is of utmost importance to the flower; for were the pedicel to remain the same length after removal, the pollinium could not effectually come in contact with the stigmatic surface, and fertilize the flower.

The ordinary movement of depression does not take place in *Phalænopsis amabilis* and *Phalænopsis Luddimanianum*; but the straight pedicel, after removal, immediately becomes arched, or bowed, in the centre, owing to its elasticity.

When the pollen-masses of *Disa grandiflora* are removed from the anther-cells, they do not undergo the usual movement of depression, for the weight of the pollen-masses is sufficient to adjust them into a position suitable to come in contact with the stigmatic surfaces of the flowers.

THE BOSQUET OF JULIA.

By A. H. Swinton.

THE storms that scour the Channel arrive not always at this region of milk and honey, to stir up the black bile. The days that precede the vintage at Clarens are sweetly sunny, and the Dent du Midi shows its three molars and an eye-tooth, almost divested of their lip of creamy snow, whose presence, as the cloud level falls, explains to the peasant in a simple way why the destructive hail is formed overhead. Below, in the mirror of the lake that murmurs not, the dainty gulls, *Larus ridibundus*, fleck the deeps around the Castle of Chillon; the winepress is prepared, the atrocious starlings are arriving in flocks, and the sunflowers, which soon attain an age of discretion, are quite bent with the burden of their platter-shaped heads. Tell me, youth, I pray thee, where is this Bosquet of Julia, ycleped the oak-grove of Lauvabelin, that we may repose awhile from travel and the burden of years, beneath the bend of the stirring branches? The reply is lost in the whir of the electric tramcars that go whizzing past along the prosaic villa-lined roadway, and in the exclamations of a party of maidens, who are pointing upwards to the grey limestone peaks, black with firs, as a proper sanctum for five o'clock tea. There is not, and doubtless never was, any bosquet replete with fairy-formed and many-coloured things, and they are inviting us to track their nimble feet up the steps of shingle, scored and rounded in glacial days, to the green upland slopes, where bashful spring pours forth her baskets of white and scented narcissus, oxlip, primroses, and topaz-blue gentians; let us, then, follow and see what the season has in store. Possessed with pleasant thoughts, how soon the blandishments of the aerial silence are gained, and see already the intrusive vineyards, planted by the beneficent monks, and presided over by the cupids, lie below; and no sound now greets the ear save the threshing of walnuts, the drop of the gravid pear, and the distant echo of the woodman's axe, from where yonder streamlet delves down its long cleft into a seething cauldron, and a canopy of stalactites, feathered with moss and plumed with fig-leaves, is dripping its diamond drops to augment the silky blue of Leman's Lake. Cockneys, they tell us by the way, come here and say that this delightful appearance is due to suspended particles of dust, and return to wonder why the Thames is not bluer, whereas a little attention of a cloudy morning is sufficient to convince any one that the blinks are painted on the blue reflecting water, and reason says that their brightness is due to the amount of sunlight; for do not Iris and Aurora here roam on earth, descended from the sun the summer long?

Les Avants on the left and the Pont de Pierre on right, says the sign-post, with reference to the past and present—whither are we bound? Could a doubt be entertained? There is hardly time to pick a snowy spray of Berteroa from the refuse-heap beside the hen-coops, a place of resort from which we have sometimes started that pretty bird the hoopoe; and the merry voices are already heard resounding down in the dreadfully steep ravine, leaving us to discover a recreative zephyr, where sun and shadow meet and sport upon a sleepy meadow. It is too late in the season to expect that flying wonder *Ascalaphus cocajas*, neither bee nor beetle, to come wandering by. Let us, with the assistance of Dr. Schoch's handy little pamphlet, "Die Schweizerischen Orthoptern," published at Zurich in 1876, try and name the grasshopper hordes that crowd like knights errant around. Here is, to be sure, *Stenobothrus pratorum*, pricking off his notes with fourteen beats of his black knees, *rufipes* in red and black, affecting the shades, the golden green *Brachyterus*, interesting on account of its semiapterous condition, and *Morio* with the dilated fore-wings, loud and boisterous and earliest to appear. He, of all the little grasshoppers, is perhaps the only one that will live and thrive in confinement, when moving his crank-like legs from thirty-five to forty times, and striking with the end of his bow, he diffuses a bird-like warble through the room—a call to industry—resembling the dirl of a circular saw, followed by scissor snippings, which is rung out day and night until the moon refills her horn, in defiant response to the carpenter's plane, the blacksmith's hammer, and the rumble of the carriage-wheels, as though he resented the appropriation of his green orchestral meadows by the mechanical crew who have created an engine that roars and screams. How plentiful and various are the grasshoppers! had we a season to spend in a chalet, we might seek some confirmation of the presentiment that the females love a male wearing their own favours, and that nascent species thus take their rise from the ring-streaked, specked and spotted; or we might seriously enquire whether an occasional whiteness appearing in all the hoppers, were not a kind of goiter due to the limestone soil, and ask why others are so very pink, for certainly the pink selection would be a pretty one. Now let us continue on to the heap of stones beneath the trees, where the wood scabious is growing in the open with hairy and divided leaves, like its meadow congener, and the larger sorts do congregate. *Arcyoptera variegata*, with the rosy legs, here hops and hides among the tufted thyme and plantain, and the rattling grasshopper leaps from the clover tufts on his reddish-orange wings, with a startling rattle, as the inflexed margin of the fore-wing rubs on the raised air-vein on the hinder, for its wings were never made to clasp; his portly self-indulgent female, who hops but little, remains alcoved, toad-like, in the briars. *Œdipoda cerulescens*, too, here unfurls a crimson wing, while its blue-winged variety, if variety it be, prefers the company of *Gomphocerus rufus* on the vineyard pathways we have left below, where a drier vegetation may prove to be less acidulated. Let us now cross the bridge constructed in the year 1772, that brings back to life the shade of Rousseau, and which time has fringed with malformed dewberries; let us climb

Fig. 40.—The Rattling Locust of Europe, male and female, double-headed daisy, and small scabious with a flower in the axis of the leaves. The male *Œdipoda stridula*, or Rattling Grasshopper, takes flying leaps in the woods with a somewhat startling rattle, owing to its wings rubbing together.

up the steep pathway, overhung in the spring mowings with the *Spireæ aruncus*, where grows the *Aposeris fœtida*, undistinguishable from the local form of dandelion, but very nauseous; so till you pluck it the umbellifer leaf is undistinguishable from a fern, situation determining the form. Here in the shade the velvety leaves of the wood scabious are broad and entire, and its reddish heads are quite colonized with invisible insects, one of which the microscope reveals to be a black fly, and beside him sits his orange spouse.

But what strange shouts are these that jar upon our ears. Das Feuer, voyez-vous, un fuoco, cto takoe. It might really occur that our maidens must have kindled a hearth in the vicinity of that little excavation with a mound in the centre, that has been thought to date from fabulous times; to the dismay of certain guardian spirits, some mistaken mortal to whom the rock overhead, fashioned like the Pope's cap, and the surrounding hat-like eminences were never metaphysics. But see, here comes one of the party, with downcast look, in search of a tree that she has espied from afar, and which seemed to be hung with roses; with little doubt an aspen, which is shedding its clam-shell-like leaves at our very feet. Infallibly its autumnal bravery, so suited to recall the ruddy beauty of Miocene, is fated to compose certain fairy chaplets for amateur theatricals, when the mountain blue-bells, so very puzzling to name from Gremli's Flora, are to be hit off with a tea-spoon.

The last car has commenced its picturesque descent from the Jaman and the Naye; a dark green shimmer sleeps on the slopes, and a red reflection beams from scattered chalets, that pleasure envies, and love and piety have framed, we must needs say farewell to these delicious groves. Yet pause awhile. What is this hollow snore that blends with the rushing of the water over the boulders, and the drone of the wind in yonder beechen thicket? One would fairly think that our pretty and spiritual maidens, fresh from their bivouac were ensconced therein like dormice, and sound asleep. Let us approach softly. Our mutual curiosity has introduced to our notice a legion of crickets. In the rank and wet grass the minutely black wood-crickets with ears on their legs, and a violin on their backs, are hopping like fleas, and now and again, the bulky wart-biter comes tumbling along down the gloaming with a heavy thud; his wings, we see, are green, when he is tempted by a cornfield into the blaze of the noontide sun; like the leaves in autumn they commonly change to brown; griseus, a born Creole, arises and flutters on its filmy wings. These, one and all, would appear to be the mere satellites of the great snorer *Locusta cantans*, who is stalking at his leisure over the blackberry leaves, or blubbering out to his females, who are flouncing about in the surrounding herbage. As his notes salute the human ear as it were the jig of the chucky-stones in a pot-hole, it occurs that the fitful and peevish chree would form a proper interlude to the knife-grinding tune of his long-winged cogener, who must be in fine form behind the garden wall, whence we saw his female take wing and fly as we came up, to escape the snap of a grey lizard, otherwise she was inclined of course to leap. Mark, too, what evident adaptability is displayed in this very ancient race of creatures, that is coeval with the coals that compose the briquette. *Locusta cantans*, ghastly and pale, short winded, bold, and callous; *Locusta viridissima*, long-winged, verdant, and wary; *Decticus verrucivorus* marked like *griseus*, but with a slender, straightish ovipositor, suited to probe the tall herbage. Let mortals who have sighed for pearly manna, preservative balms, and an existence on fibrous roots and herbs, refrain altogether to inquire into the ancient morals of the bosquet, where monsters appear to suck the pulsating life, and where, in the space of a few days, mutilated limbs, long feelers nipped short, and a languid pace, must reveal a frightful order of things.

The shades imperceptibly deepen in the cricket-haunted thicket on the banks of the Baie de Montreux, and we ought really to descend before the beauty of the day has flown. It is not yet, perhaps, too dark to notice on the reed-stalks where the marsh thistles. *Cnicus oleraceum*, are overhung by the alder-leaved Rhamnus and glossy Guelder berries, the smallest of the Leaf-crickets, *Rhacocleis dorsata;* no bigger than an earwig, they seem to be, with feelers three times the length of their bodies, and legs that resemble spun glass. Yet the males are churring in long spells, like the big viridissima, as it were a number of watch-springs suddenly vibrated; and now from the ooze, *Mecostethus parapleurus*, a slender verdant and brown grasshopper, leaps on to a reed-stalk, and takes two or three paces backwards, as if it were shy, or because the soft cushions on its hind legs are the merest trifle flat, for it walks in its parent's steps. Here, in the dell beside the cottage, the Saponaria discloses its deflexed lilac petals diffusing a sickly smell, and a drone-fly-covered aster spreads its purple stars, neither perhaps having more the rights of possession than the *Scabiosa purpurea* we have met with in a Ramsgate meadow, where it seemed hardly at home, and quite unsuited to inspire the swift thought of beauty.

How pleasant on our return is the seat on the balcony, for the autumnal mists have brought back the lovely purple and orange sunsets! From the iris in the west there shoots up a rosy-fingered ray that casts a bloody stain on the face of the tranquil water, and tinges the snows on the Dent du Midi with magenta; while the moon looks icy cold, over the dark-blue crests that enthrone the Sugar-loaf, and wall in this recluse corner of the lake. Then there arises a hand-like cloud that takes spectral shapes as it advances, and warriors, bulls, and recumbent goddesses stand out depicted by the waning glow above the frequent flash of the tempest. The moment is propitious to set the wild-flowers we have gathered in water, in order that they may run to seed for friends at home; has anyone ever thought of preserving also, the seeds of those that are mal-formed. In the hush that precedes the storm, the notes of the piano resound, the glasses are attuned by pouring in water, the comb, covered with thin paper, is kissed into a dirl, and a language of the feelings is heard; while our dark-eyed maidens touch the notes, the grasshoppers and leaf-crickets sound their little whistles, marking the stress, until the loud notes spread alarm: then one good-night carol more, and the rolling thunder alone is heard. The vintage morning has come, the point of the Jaman is fleeced with snow. Six weeks more, they say, and the winds of winter will howl along the Valais.

Note.—Bosquet de Julie. Above Lausanne, on the slope of the Jorat, there is an oak-grove, which may have extended; the wood at Clarens, Byron imagines, but never saw; Clarens, formerly a dirty village, is tree-less. Like William Tell, the wood at Clarens is perhaps a hoax, as was Julia, wild and sweet.

THE WATER-RAIL.

ALL the crakes are retiring species, living where they can hide from man, and conducting their operations, whenever possible, in secret. This shyness or disposition to remain hidden from public gaze is seen clearly enough in the common water-hen; it is much more marked in the case of the corncrake, only that that bird tells us of its presence by its cries; and with our other common species, the water-rail, shyness is carried to an extreme degree.

The water-rail for the most part passes its life unknown, hidden amongst the herbage that grows by the side of its favourite stream, or skulking amongst the flags and reeds on the lock's swampy edge. Still, when once we know how to take advantage of the suitable conditions, we can get within reach of this bird, and observe it also.

Whilst the summer remains, and the water-plants and grass grow high, we have no guiding marks to tell us of the bird-life hidden by the edges of the streams and locks, but when autumn has gone, and the snows of winter lay a soft covering upon the earth, we have such a guide in the markings made on the snow. On such a day, we enter the reed-beds, which still rise above our heads, and keep a sharp look-out as we thread our way along the paths formed by fisher, shooter, and birdnester. The water on the adjoining lock is not yet frozen, and the little stagnant pools and ditches in the marshy ground consequently still attract their birds. There, the footprints of a water-hen run along the road before us, and become presently confused with the footmarks of other water-hens. Now we come on another mark, in kind exactly resembling the waterhen's, but not so large. On comparimg this new mark with that of the waterhen, we notice at once a difference in the extent and depth of the footprints. These smaller marks reveal the presence of the water-rail, and, though we may have at the time no further evidence, we yet have sufficient proof of its existence in our neighbourhood to cause us to keep a continued watch for it.

Again we visit the lock when the surface is frozen. The ice is hardly strong enough to bear us, but covers the lock, except at a small patch of about fifteen yards by ten, which may have been kept from freezing by the action of the birds upon it. A single swan is there, accompanied by coots, tufted ducks, and pochard. But more important at present for us is yon small bird that is walking on the ice, finding now and again some small morsel of food. On it comes towards the little pool, and walks on the verge of the ice. How delighted we are to obtain such a view of a water-rail undisturbed, moving as freely and as carelessly as if he were safely covered beneath the shelter of the reeds. But our joy does not remain long, for, though only our head is visible, the bird has evidently noticed us, and has made for the shore at the very moment when we direct our glass on the larger birds.

'Tis winter still, but to-day the frost is hard, and skaters are hurrying off for the ponds and locks. We ourselves are early on the march, not to enjoy a day on the ice, but to enquire after such birds as may have been compelled by the ice to retreat from their wonted haunts. The skaters have full possession of the lock, and no swans, coots, or ducks are there. The ground of the surrounding marsh, usually soft, is hard and firm beneath the tread, so that our searching here is not likely to be of much avail. We therefore take our course along the burn that flows out of the lock. On the left bank, a hedge separates the burn from a field in which cabbages are still standing, and on the right is an open meadow. On each bank water-hens are cautiously feeding, and now and again a large water-rat makes a short excursion from his home, but soon returns to shelter. I stand on the left bank, and my brother walks down the right. Soon the birds are aware of the intruder's presence, and begin to move. First, there issues from beneath the hedge a water-rail; with neck stretched forward, it runs quickly along the hedge-foot, several times acting as if it would again return to shelter, but ever again continuing its running as my brother advances, and now it rises and flies over the field to some potato-pits beyond the cabbages. Water-hens, black-birds and finches also issue from their retreat, but they do not attract my attention when better things are to be seen. Arrived at a bend in the burn, my brother works now so that his actions are unseen by me, but rouses a pair of water-rails, which take refuge in flight. Now he turns and walks back again towards me, frightening out only blackbirds and such like till he approaches his starting-point, when another water-rail that had remained hidden on his outward walk, now apprehends danger, and dodges out from beneath the hedge. I distinctly see its colour and its red beak, and I contrast its bulk with the water-hen's. Now it stands a yard or two from the hedge, uncertain as to how it should proceed. Its back forms a sort of regular curve as it stands with head erect and tail slightly raised, after the manner of a water-hen. Unable to make up its mind, it behaves as if it were dizzy, and seems now to be certainly making straight for the cabbages, but now again as certainly makes for the burn. Just as I am beginning to think whether I ought to give chase or not, it decides that escape is the better plan, and off it flies, strong on the wing, and is soon lost to sight.

Such, then, is the process by which we come to a knowledge of this shy bird. We may, however, first identify it in another way, if we should happen to come on one lying close in the herbage. One day in August 1890, my brothers were walking along the banks of the North Esk in this county, when one of them noticed what he considered a dead bird lying in a tuft of rushes. He lifted it by the foot, and it at once began to show that it was alive. The bird was a water-rail; and my brothers took it home, where they exhibited it. They then tied a string round its leg, and allowed it to swim for a while, after which they released it, and it quickly disappeared by running.

ROBERT GODFREY.

FEATHERS.

By JOHN R. LORD.

Introduction.

WHEN a wonderful invention is brought before us, so that we clearly see its results, are we not naturally curious as to how these results are brought about? The spirit of looking into what we do not understand seems to be one of our natural instincts. A boy when shown a watch naturally wants to see and handle the works, a proceeding often not favourable to them. Still the principle is there, and a very good principle too. It is one which, if trained, leads, and has led, to very creditable results; for have not many of the great facts of science, etc., been brought to light in this way? The results of enquiry into the mysteries of the universe are very numerous. On one hand we can foretell, to a certain extent, the future state of the weather, the times of high and low tides, when stars will be visible or not visible, when comets will appear, or when the sun or moon's face will be darkened to us. On the other hand look at the great industrial or social improvements and advances, all brought about by men searching into the secrets of nature, or by men enlarging and improving their predecessors' works.

Now I am going to bring before your notice some simple feathers, tell you their uses and their structure. Perhaps it may seem ridiculous to write about such seemingly simple things, but you will form your own opinion afterwards. I do not promise you an easy task to understand them; but if I succeed in showing that the simplest items of God's handicraft are not despicable as a study, you and I will be well repaid for our time.

Uses, etc.—Feathers are, as you know, a very characteristic feature of all birds. It was in consideration of this fact that Blainville proposed to name the subkingdom of birds (aves) *Pennifères*. It would be foolish for me to attempt to describe how a bird flies, for in a minute or two by careful observation you can learn more than I can write in two pages. It is sufficient to say that when the wings are outspread they expose a broad surface to the air, so that the bird can either float with the wind, or by convenient movements of them make headway against it. The long feathers of the tail are used as a sort of rudder to assist the bird in steering to its destination.

You will see how handy the wings work if you call to mind the membranes of a bat. Although a bat can fly, and the membranes are strong and resist the air well, it cannot pack them as neatly as a bird can. Wings offer a considerable resistance to the air, expose a large surface, and can be retracted and packed in small room on the sides of the body, so that they are no impediment to walking on *terra firma.*

Feathers are non-conductors of heat, and help to keep the high temperature of 110° F. normal in birds. The normal temperature of mammals is 100° F. By an ingenious arrangement air does not pass at all readily through feathers, especially those of the wings and tail, which is a considerable advantage in flight. In some species of birds, especially aquatic birds, it is desirable that their feathers should resist the passage of water. This is secured by the act of "preening," in which the feathers are anointed (by the passage of the feather through the mouth) with an oil got from a sebaceous gland, termed the *uropygial gland*, situated at the posterior end of the body. This gland opens to the exterior by two apertures situated on elevated pieces of flesh.

Moulting or changing of feathers occurs once or twice a year. The old feathers gradually either become loose and drop out, or are plucked out by the bird, their places being supplied by new ones. It will perhaps be convenient here to sketch the formation and development of a feather.

Development.—The external skin first becomes pitted in, and the mouth of the pit closed by the adherence of its sides. Thus you have a tube-shaped cavity lined with epidermis synchronous to that on the outside. A fluid is now secreted at the base of this sub-epidermal tube and becomes enclosed in a sheath of a horny texture, pointing to the exterior. The feather is formed in this laboratory, as we may call it, and after having approached very near the surface and burst, the juvenile feather makes its way out and soon arrives at maturity. As the feather is formed from the formative fluid, this fluid dries up and remains as the membraneous substance found in the interior of the feather.

Varieties.—Feathers differ both on different birds and on different parts of each bird. Thus they have served as a basis for classification. Examples of various kinds of feathers on different birds are easily met with, as those of the ostrich and goose. Notice how brilliant are the colours of some birds, as humming-birds, lyre-birds, or even the canary, in comparison with the sober-clad hedge-sparrow, thrush, etc. Some species of birds have all their feathers downy. Thus feathers vary on different birds in structure, colour, and texture. Singular things are found on some birds, as the herons, called *powder-down patches;* these are caused by the tops of feathers of a peculiar downy nature, breaking down to powder or dust as fast as they are produced.

As before stated, feathers are of various kinds on the same bird. If you examine a bird, such as the hen or pigeon, you will see that a certain class of feathers cover the body generally, head, neck, breast, etc. These are termed *contour* feathers, or *pennæ.* In other parts of the body, *i.e.* the wings and tail, you find feathers of a much stronger and larger build, these are the quill feathers. Those on the wings are termed *remiges*, and are subdivided into *primary* or *secondary*, according to their position. The tail feathers are called *rectrices*, and are sometimes arranged in a grotesque but beautiful fashion, as on the peacock or lyre-bird. Small feathers cover the somewhat ungainly insertions of the quills, called *coverts*, as their function implies.

If you had to pluck the bird in the ordinary way, you would notice two things. Firstly, that there still remained on the bird small downy feathers, which are *filoplumes.* Their peculiar structure I shall note afterwards. Secondly, that the feathers were crowded in some parts of the integument, while on others they seemed more or less scarce. The covered areas are called *pterylea*, the uncovered areas *apteria.*

Structure.—An individual feather consists of a quill prolonged into the *rachis*, which gradually tapers to one extremity; from this rachis arises on each side a series of processes called *barbs*, and from the barbs, and at right angles to them, arise a diminutive set of processes termed *barbules.* The ingenious structure and uses of these barbules is the most interesting feature about a feather. The barbs are thin like paper and curved, the convex curve being nearest the insertion of the feather. The barbules are arranged in two rows, one on each side of each barb. It is a difficult thing to describe their exact position, but a ⊤ represents it roughly, the two horizontal limbs corresponding to the two rows of barbules, and the vertical limb the barb. The barbules are nearer the outer surface of the feather, just the opposite surface to that represented in Fig. 41. It is evident that one row

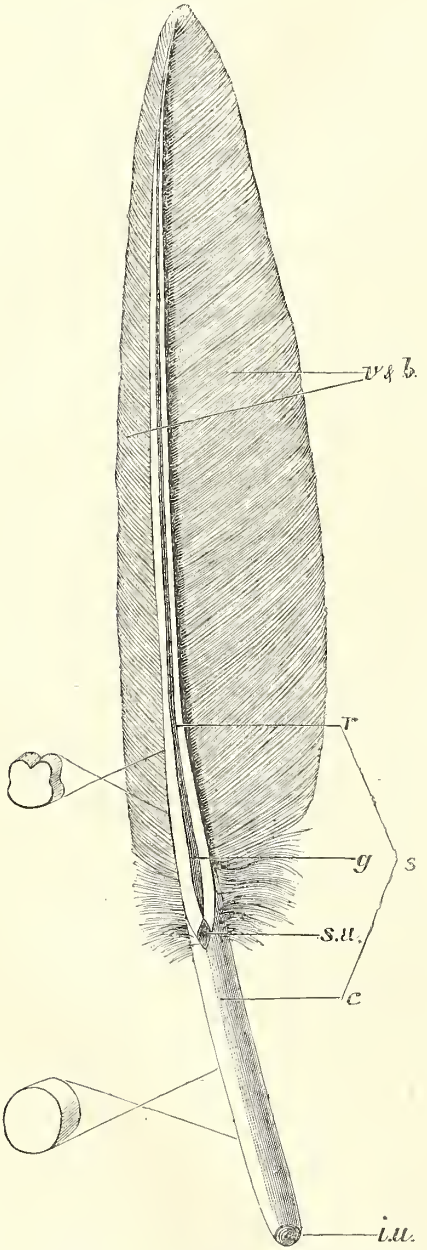


Fig. 41.—Quill Feather, under surface: *iu*, inferior umbilicus; *c*, calamus, or quill; *r*, rachis; *s*, stem; *su*, superior umbilicus; *v*, vexillum, or vane composed of barbs. [J. R. L.]

will be nearer the insertion of the feather than the other. The former we will call the *proximal* and the latter the *distal* row. The distal row of barbules are flat and broad at one end, but narrow, branched, and hooked at the other, as shown (D) in Fig. 42. The proximal row of barbules are also flat, broad at one end and narrow at the other, but are not branched. The narrow ends interlace, making the whole row look like a step-ladder. We can foresee what will happen when two opposite rows come together naturally, viz., the distal row of one barb and the

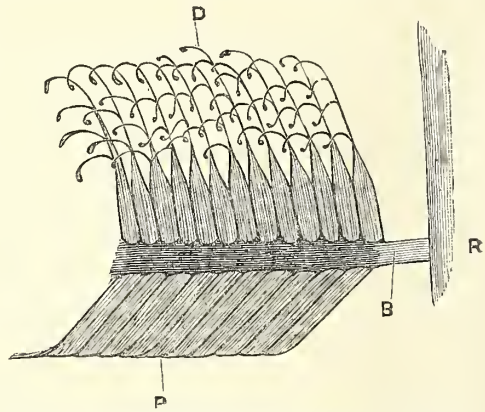


Fig. 42.—Diagramatic drawing of the relations of barbs and barbules. [J. R. L.]

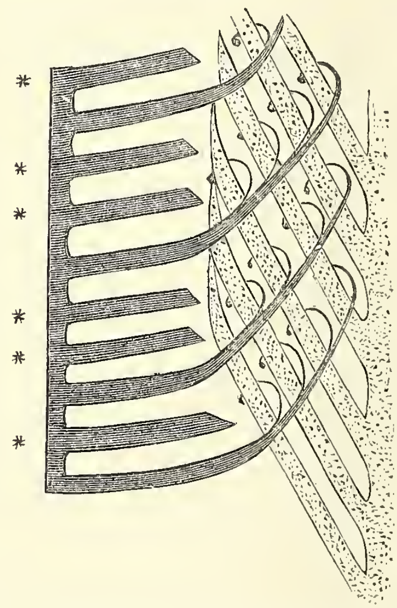


Fig. 43.—Diagram of the interlacing of barbules. [J. R. L.] (* Not shown, so as to avoid complications.)

proximal row of the one next to it. What occurs is represented very simply in Fig. 43. The bird, by passing the feather through its mouth, lifts the distal hooked row of barbules on to the proximal row of the next barb, the hooks and branches of the one catching the ladder-like arrangement of the other and thus causing the barbs to adhere. A simple experiment will verify this explanation. Take a quill feather, hold the under surface downwards, separate two barbs, and lift the one nearest the quill of the feather over the other one, and they will both adhere. If they are simply put together they will not adhere.

Space will not allow me to write more, but much more could be written on the subject. Probably the *superior umbilicus* (see Fig. 41) allows air to pass into each feather, making them weigh very little. Lightness is proverbial and characteristic of feathers. A little vascular papilla fills the inferior umbilicus. The feather is inserted into a sac, to which muscles pass. By contraction of these muscles the feather is erected. Filoplumes may be regarded as feathers with a degenerated or stunted stem, giving them the appearance of a row of hairs on the end of a small quill. Traces of barbules are seen on some of them.

NOTES ON NEW BOOKS.

FINGER Prints, by Francis Galton (London: Macmillan). This is one of the most original and suggestive physiological and psychological books issued for some years past. All readers of Mr. Galton's new books expect something original, and they will find it in this volume. Even superstitions have a basis of truth, however scanty, and it would seem that the medieval "science of palmistry," as well as "reading the lines" among modern gipsies are not exceptions to that rule. Perhaps the criss-crossing on the formal red seals of deeds and wills really represents those of the human skin at the finger-tips. Mr. Galton's work is a genuine and hard-worked contribution to scientific research, and appears as a very handsome and attractive volume. Characteristically enough, the illustration on the title-page is that of the finger-tips of the author, from the markings of which we can hardly doubt character as well as suggestiveness.

Castorologia; or, the History and Traditions of the Canadian Beaver. By Horace T. Martin (London ed., Stanford). A capital monograph of this rapidly acceleratingly extinct, and interesting creature, beautifully illustrated, and described by a sympathetic naturalist. The beaver never received such good treatment before. Everything that can be said of it —palæontologically, zoologically, or from a purely natural history and economic point of view—has been carefully and diligently gathered together in this volume of fifteen chapters.

The Building of the British Isles—a Study in Geographical Evolution, by A. J. Jukes-Browne, second edition (London: George Bell & Sons). We had the sincere pleasure of commending the first edition of this interesting and valuable work. Mr. Jukes-Browne occupies a high position among modern English geologists, as being one of their most diligent and conscientious workers, and everything he publishes is accordingly read. We need hardly do more than state that this "second edition" brings the whole subject up to date.

Charles Darwin, by Francis Darwin (London: John Murray). This is the best "working" life of the great naturalist, told by his son, autobiographically (that is, really in a selected series of letters, etc.), which has yet been issued. Its title-page is faced by a photo-gravure of the grand old man—the "Newton" of biologists. His son's opening chapter of his life is frank, affectionate, and simple. The connective letters are breezy, cheerful and suggestive all over. This life of Darwin ought to find a place on every naturalist's book-shelf, as we have no doubt it will, thanks to its moderate price. Mr. Darwin has so impressed his strong individuality on us, that we are all longing to know more of the simple, and truthful, and altogether lovely life he lead at his Surrey home. This volume is practically an abbreviation of the "Life and Letters of Charles Darwin," published in 1887.

Strange Survivals, by S. Baring-Gould (London: Methuen & Co.). The author is well known as historian, essayist, novelist, etc. His literary power and indefatigability are enormous, his keen and original observation no less marvellous. In this beautifully printed and well got up book we read pleasantly and profitably all about foundations, gables. ovens, beds, strike-a-lights, umbrells, dolls, ballads, riddles, holes, and even the gallows. It is a delightful book to peruse.

How to make Common Things, by J. A. Bower (London: S.P.C.K.). A delightful boys' book. With this and a half-sovereign chest of tools, a lad could make most common things himself, teach himself the use of his fingers and thumbs, and the important principles of natural philosophy without knowing it. The illustrations are all original, numerous, and good. So is the letter-press and general get up of this half-crown book. We cordially commend it.

Our Country's Birds and how to know them, by J. Gordon (London: Day & Son). We have much pleasure in noticing this little volume. It is a clear, concise, methodical and brief scientific classification of our feathered world. Each chapter is set apart for its own special monograph. Thus the first is "The Names of the Birds," and therein we find an alphabetical English list of them, and to each one is affixed its Latin cognomen. The next chapter is devoted to their local and popular names. A scientific list gives the families, genera, and species, but Mr. W. J. Gordon has been careful throughout to give the English name as well as the Latin, which the young ornithologist finds more useful and comprehensive. Thirty-two coloured plates at the end of the book (which comprises in all thirteen chapters) are taken up with a short and precise account of the various families, genera, and species, together with the size, etc., of the bird, and its egg.

A capital book for lads fond of birds or eggs which require identification.

The Hemiptera Heteroptera of the British Islands, by Edward Saunders (London: L. Reeve & Co.). This is a valuable and useful monograph for the increasing number of students of our British Hemiptera. Entomology is no longer a science of collecting and classifying butterflies, moths, and beetles; its cast-net is now thrown over the entire insect fauna. Mr. Saunders' reputation as an entomological authority is everywhere acknowledged; and the book before us contains his descriptive account of the the families, genera, and species indigenous to Great Britain and Ireland, with notes and localities, habitats, etc. It is an eminently useful manual for entomological students.

A Memorial of Joseph Henry (Washington: Government Printing Office). The Americans know how to appreciate their scientific men. Professor Henry was the first president of the A.A.A.S. in 1849. Afterwards better known as the presiding genius of the Smithsonian Institution, which sends forth its literary scientific treasures with such a free hand all over the earth. This well-got-up volume is the best memorial the nation could give him, infinitely better than a bride's-cake effigy in cheap marble, put up somewhere where it would be easily blackened!

A SHORE-WALK IN APRIL.

We have taken the first boat across the ferry, and are set down at Burntisland at 7.52 a.m. Soon we pass through the stirring town, and turn along the narrow path that leads to Aberdour. Starlings are crying from the telegraph-wires, and rooks are making a much greater din from their home near the shore. At first our chief companions are the small bands of greenfinches that fly on before us, chirruping to one another, whilst others, stationary in the trees, utter their drawn-out *tway;* but when we come to the wooded portion of the way, we exchange the companionship of these birds for that of chaffinches and tits. For half a mile or so our path keeps to the inland side of the railway, after which it passes beneath it and runs along the shore. On to Aberdour we have the railway on our right, and the shore on our left, from which, however, we are shut off by wire fence and patches of shrubs, alternately. Save the ever-present gulls, and the cormorants, seated on the rocks that project from the water, we can expect to see little here, and hurry on to Aberdour woods, where our footpath is no longer closely hemmed in on each side. The wood resounds with varied song; most prominent is that of the chaffinch, but blended with it is the yellowhammer's monotonous tune, the long drawl of the greenfinch, and the musical, plaintive cooing of the cushat. Blackbirds and thrushes rise before us as we advance, and a little wren hops along the edge of a ditch, halting at short intervals to deliver a part of its song, and drooping its wings as it does so.

Descending to Aberdour Harbour, we pass round its inner side, and continuing our journey along the front of the villas, we soon escape both from houses and from railways. We keep to a path rudely shaped in the rock, which, in summer, is trodden by many feet, but at this time almost deserted, till we find a headland, up to whose base the tide has come, rising to intercept our progress. We therefore mount the dyke that has compelled us to keep close to the shore, and cut across a field to the bay beyond. Round this bay and the next we proceed, without noticing anything particularly interesting, and come to a small house, or cave, situated on the top of a cliff. This building is so constructed as to escape the notice of the passer-by, and has its roof level with the grassy ground above; it is not now occupied, but it may have played an important part in connection with the Monastery of Inchkolm in earlier times.

After searching its interior in vain, for signs of owls or sleeping bats, we cross over from this small peak to another, and, as soon as we look over to the shore, a redshank rises, followed closely by a pair of shellducks that have paid attention to his warning cry. These latter birds uttered a low, guttural cry, like *shuck shuck*, and as they flew, they presented a beautiful and varied display of colours, white being the most prominent, with black head and black-tipped wings, and chestnut on the upper part of the back. On coming forward to the place from which the shellducks rose, I am attracted by a spring note, *chack chack*, and I know that the wheatear has arrived. Flying with wavy flight, and showing his white rump conspicuously, he lands on a stone. He bobs once or twice, then with head bent down he hops away from it so quickly that he seems to run, picks up something, turns round, and hops as quickly back again to his old perch. Several rock-pipits and a pied-wagtail are also flying about here, and up now gets the redshank once more, and with his quivering flight and his loud *khew-hee-hee*, hurries along to the east, past us.

Having crossed a short stretch of stony ground, and welcomed a little wren thereon, we enter a wood. Away flies a blackbird, with his terrible scream; another follows, and then off scampers a rabbit. Excepting these, however, there is no commotion; one ignorant of his ground would little suspect that here is a heronry. There seems to be no heron about, but as I walk beneath the trees, presently one slips off its nest as quietly as possible, and then another and another. The heronry wood covers a piece of ground that rises from the sea with a rather steep gradient, and as the herons' nests are built on trees, situated at the foot of the slope, it is possible to see into these nests by climbing to the hill-top. With this purpose I ascend the slope, and as soon as I have reached the summit, the herons that are soaring overhead begin to call loudly, *yank yank.* I lie down under a low tree, and confine my attention to one of them. Now it is alone; it passes over, high in the air, and it passes back again; down it comes a short distance, and passes and repasses as before. As it thus gradually descends, and limits the circuit of its flight, it brings its legs more and more near the perpendicular, till it suddenly plumps on to the branch on which its nest is. Then cautiously it steps over to the nest, and standing on the edge of it, with neck erect, it peers about enquiring for the intruder; being satisfied that he is gone, it sits down with its head turned towards the direction in which it saw its enemy disappear. I crawl back to be out of its sight for a while, then lift myself up slowly. But Mrs. Heron is too wide awake for me: she has seen my hat before I have seen her, aud is already standing on her nest; and now, stretching her neck and pushing with her feet against the nest, she rises once more into the air.

I now leave the heronry, and go out along a promontory at this part of the shore. As I look back from this position on the heronry, I see a single bird stationary on a thin branch near the top of one of the tall trees. He does not sit with his head close to his body, as a heron that has settled down by a burn-side to rest during the day would do, but he sits with his neck stretched to its utmost, ready to perceive the slightest indication of danger, and on my making again for the heronry woods, this sentinel heron flies away.

As I continue my walk, the herons keep up their cries, and the pheasants strive to equal, if not to outdo them. Eight shell-duck and six mallard are swimming about in the bay, several cormorants are seated a short distance out from land, and curlews close in shore are giving warning to all who care to heed that danger is at hand. The cushats are flying in considerable numbers to the heronry wood, and the rooks are making a hideous uproar in the rookery further on.

Leaving the herons behind, we now cross an open field, and as we walk rather carelessly, are abruptly reminded of our business by hearing a loud squealing at the edge of a small plantation in advance of us. There goes a blackbird, he it is that is squealing; and there goes the cause of it, that light-coloured bird of which I caught a glimpse as he dashed along within the hedge that borders the plantation. Twice or thrice I see him momentarily, but no distinct view can I get of him. Though I cannot make him out properly, I know well that he is some bird of prey, as all the small birds in the plantation are joining with the blackbird in the scream.

Along the inner edge of the plantation we now take our way, and, after halting a short time to examine the ruins of Dalgety Church, within whose ivy-clad walls is an excellently-preserved stone of date 1540, we enter the wood where the rooks dwell, and of which we had timely warning by their cries. We need not linger here, however, but walk on over the long stretch of smooth lawn, raised somewhat above the level of the beach to be beyond the force of the waves, and at its end we come on a pool of water. The very place for a water-hen, we at once conclude; let us look—there goes one scudding along the surface, and splashes into the water at the opposite side; and there too is the last year's nest at the end of that branch overhanging the water. As I still stand here, a missel-thrush makes known his presence not far from me, and I look up to see a pair capering amongst the trees.

We are now at the corner of the bay, and as we advance, we rouse many curlews, ducks, and red-shanks. But the clock at Donibristle stables pointing to 2.25 p.m., bids us proceed rather faster than we have been doing, and after reaching St. David's, we cut inland to join the Aberdour Road, and reach Burntisland in time for the last ferry-boat.

ROBERT GODFREY.

NOTES ON NECTARIES.

No. II.

By M.D. (Hawkshead, Ambleside).

Staminal Nectaries.

MANY nectaries are in direct connection with the stamens. In Penstemon (Fig. 54), so named from its curious fifth stamen, one pair of stamens is adherent to the corolla tube and the other pair is free on each side of the ovary. The honey is secreted on the outer side of the dilated filament, the nectary being a green protuberance with a granulated surface, and from it the abundant honey wells up into the tube of the flower. In the Cruciferæ the nectaries are sometimes associated with the stamens, and sometimes with the disk; for the former see Arabis (Fig. 22) and Radish (Fig. 34); in each of these flowers the nectaries belong to the short stamens. In the drawing of Radish the short stamen is removed, in order to show the nectary with its drop of honey, which stands behind it; no hollowed sepal is needed, because the drop of nectar is kept in place by the adjacent filaments. In herb Robert (Fig. 44) a protuberance at the bases of the five outer filaments secretes honey which is received in the hollowed sepals. *Lychnis dioica* (Fig. 45) affords an interesting example of staminal nectaries. In the male flower there are five long stamens and five short. The long stamens have each a honey gland at the base on their inner faces, and the honey collects in the hollow above the abortive ovary. This, it should be remembered, is at the base of a tube formed by the calyx and additionally protected by the hairs upon the filaments. In the fertile flower (Fig. 46) the bases of the aborted stamens form the nectaries and appear as white glands between the bases of the petal claws; they look something like a disk, but are really the aborted stamens. Nor in this connection must the nectaries of *Mercurialis perennis* be forgotten, since they are formed by the two otherwise useless stamens of the fertile flower, a drop of honey taking the place of the anther. It is difficult to know where to place *Parnassia palustris* with its beautiful comblike scales that look like independent nectaries, but possibly the flower had originally ten stamens, five of which have been changed to serve another purpose. The honey is secreted in two shallow pits on the inner faces of the scales (Fig. 35), and their delicate filaments do not, as some have supposed, display drops of sham honey to delude insects—a supposition worthy of this age of shams,—but from an [ornamental] *grille* to prevent them from reaching the honey without alighting in the centre of the flower.

Fig. 44.—Nectaries of Herb Robert.

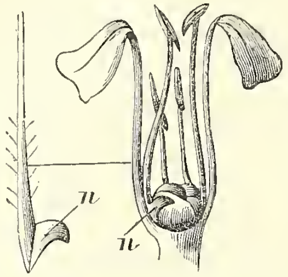


Fig. 45.—Do. of *Lychnis dioica*, ♂.

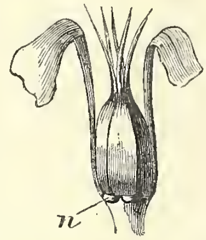


Fig. 46.—Do. of *L. dioica*, ♀.

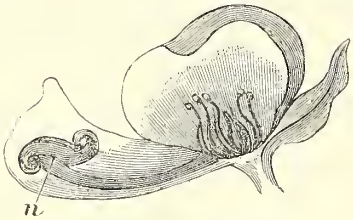


Fig. 47.—Do. of Monkshood.

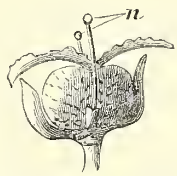


Fig. 48.—Do. of Dog's Mercury.

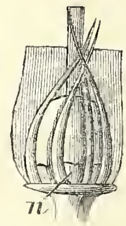


Fig. 49.—Do. of *Erica tetralix*.

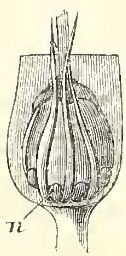


Fig. 50.—Do. of *Erica cinerea*.

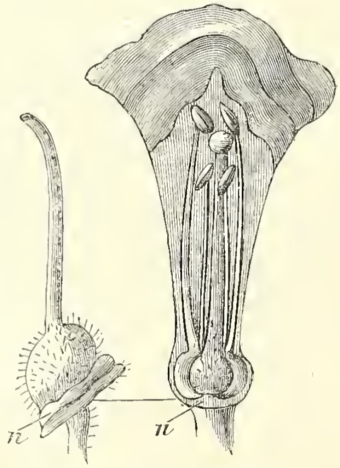


Fig. 51.—Do. of Snapdragon.

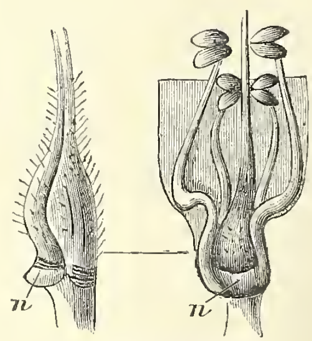


Fig. 52.—Do. of Foxglove.

Pistilline or Ovarian Nectaries.

As was stated at the outset, honey is far more frequently secreted in connection with the ovary than any other floral organ,—by the disk if the ovary be superior, and by glands at the base of the style if the ovary be inferior. The difficulty is to select a few of the best examples. In the Nat. Orders, Compositæ, Leguminoseæ, Boragineæ, Scrophularineæ, Labiateæ, Umbelliferеæ, and others that might be named, honey is secreted by the ovary or its adjacent parts. In the Ericaceæ the purple glands of the disk are the nectaries (Fig. 49), and the honey is sheltered by secretes the honey which rises in the tube. Another not infrequent form is shown in *Campanula rotundifolia* (Fig. 32). Here the upper surface of the ovary secretes the honey, which collects in the hollow formed by the overarching bases of the five dilated filaments. The hairs at the edges of the filaments are intended to close the nectary to insects who are not strong enough to insert their proboscis, as the shape of the corolla secures ample protection from rain. Amongst garden flowers the Fuchsia (Fig 33), Evening Primrose (Fig. 55), and Godetia (Fig. 56), have special honey-glands at the base of the style and on the surface of their inferior ovaries. In each

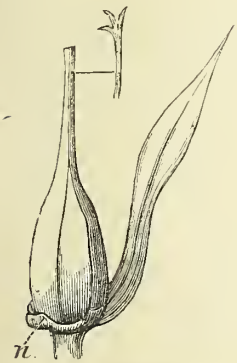


Fig. 53.—Nectaries of Phlox.

Fig. 54.—Do. of Penstemon.

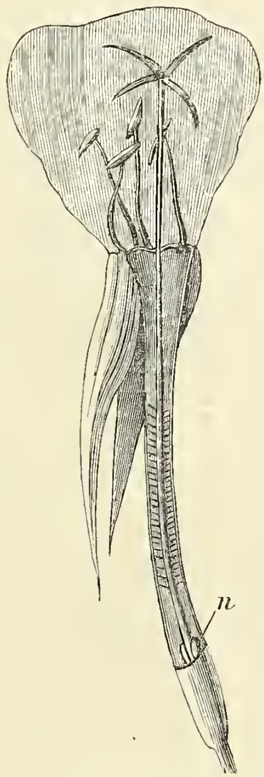


Fig. 55.—Do. of Evening Primrose.

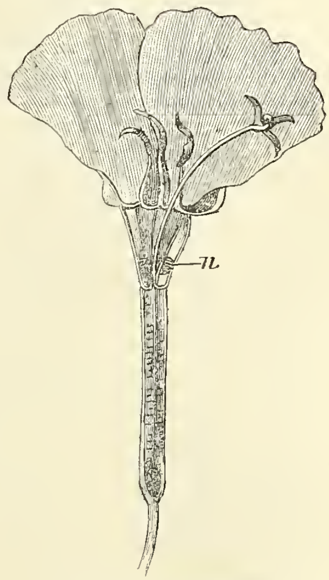


Fig. 56.—Ditto of Godetia.

the bell-shaped corolla, or in the open flowers of Calluna by the awned anthers. In the Snapdragon (Fig. 51) access to the ovarian nectary lies between the bases of the two anterior stamens whose elbows form guides to the humble-bees by overarching the corresponding channels in the lower lip. The hairs of the ovary are also studded with drops of moisture and possibly secrete honey as well as the disk. The chief difference between Snapdragon and Foxglove (Fig. 52) is that in the latter flower there are four entrances to the nectary owing to the filaments being more widely separated. In the common garden Phlox (Fig. 53) the lower fleshy part of the ovary

case the honey wells up into the tube, which in the Fuchsia is contracted at the point where the petals are inserted. In the Evening Primrose the extremely long tube prevents the honey being reached by any insects except humble-bees and moths, and it is further protected from creeping insects by the hairiness of the style at a certain part above the nectary. In Godetia the same end is attained by the closing in of the lowest part of the otherwise open tube with thick tufts of hair which press like buttresses against the style. It is interesting to see how determinedly the pistil pushes itself out of the way of the dehiscing stamens, it will have none of their pollen, and to make assurance doubly sure for some time keeps its four-lobed stigma closely shut. Last but not least, we arrive at the sweetest flower of the garden—Mignonette. The drawing (Fig. 36) does not profess to be complete, but is accurate as far as it goes. The fringed petals have been removed, as well as some of the stamens, in order to give prominence to the nectary, which is formed by the peculiarly-shaped disk of the ovary. The flower is proterogynous, and during its first stage the red anthers hang down below the pistil with its horned stigmas, but gradually rise up as they dehisce into such a position that no insect can approach the nectary without passing over them and getting dusted with the pollen.

The study of even a small number of flowers with reference to the position of their nectaries shows that those most admired for their elegant shapes or lovely colours, or that delight us with their delicious scents, seem to be just those that conceal their honey from the multitude and invite to their banquet only the favoured few. It is bees, as many botanists believe, who, by their special diligence, have helped to modify to an almost inconceivable extent the forms of flowers, though none the less, we may be assured, under the guidance of an unseen Hand. There are both advantages and disadvantages in the concealment of honey, the advantages being chiefly those of protection from rain and the possibility of accumulating it in greater quantity in spurs or tubes, and thus increasing its attraction to those visitors for whom it is intended, and excluding the short-lipped insects whose visits are unwelcome. The disadvantages are that it is not so easily found by welcome guests and that a host of possible friends is excluded. Still on the whole the advantages are greater than the disadvantages, because a greater number of the most intelligent are attracted, and their way to the deeply-placed honey is made easy to them by the so-called honey-guides, whether these be specially conspicuous markings on the corolla, or grooves or passages made by its folds, or hairs that obstruct the way, except in the desired direction, or other equally effective arrangements; but the subject is a wide one and can only be hinted at here. Some botanists consider honey to be a waste product of the plant and to stand in the same category as wax, gum, resin, etc., so that according to this view it must be supposed that no special expenditure of energy goes to its production; on the other hand it seems highly improbable that a substance secreted in so many instances by a special set of cells and guarded from injury or plunder with so much care, should be a waste product. Be this as it may, there is usually plenty of it in the nectary cells, and often the irritation induced by an examination of the flower will cause it to flow out in still greater abundance, which shows that the secretion may be less or greater according to the demands made upon it.

POND LIFE STUDIES.

No. IV.—Something about a Green Water-Dragon (Hydra viridis).

By H. Durrant.

When Trembley made known his wonderful discoveries on the freshwater Hydra, no small stir was created. The most learned of *savants*, belonging to the most learned of societies, became so engrossed that nearly everything else was forgotten in the prosecution of their countless and interesting experiments on this little animal. Courts commissioned their ambassadors to supply them with the latest news concerning such an all-engrossing theme, and scientists with brotherly solicitude for those amongst them who had not yet had a chance of investigating, forwarded living specimens to them as carefully as may be. The thing was so unprecedented, so contrary to every erst-while notion of animal-life that it was only to be expected that there would be numbers who would set their backs against Trembley's announcements, and ridicule them as idle fancies, products of the dead season, and akin to the more modern green moon or great sea-serpent. Not that the animal had just burst across the scientific horizon in the full splendour of freshness. It was 1744 now, but as far back as 1703 Leeuwenhoek had discovered it, and about the same time a correspondent of the Royal Society reported the same discovery in England. So that it was not particularly new, and, as an animal apparently with nothing of extraordinary interest about it to recommend it, had ceased from calling forth much attention, until Trembley, the immortal Trembley, stepped on the field, and all Europe stood spell-bound by his revelations.

All this happened a century and a half ago. Now the Hydra is among the commonest of the animals that usually figure in the microscopist's dissecting-trough. It has almost ceased to become a wonder, but this is perhaps bred of familiarity. However, there are still many, even now, who have never heard of Trembley. Can it be wondered at, then, that they should never have heard of the Hydra, at least the name to them is shorn of any familiar fact or picture, some fabulous monster perhaps. To these, then, I would say, read patiently on, and stern facts, if not elegant diction, shall stir you (though less powerfully, perhaps), as they did in that memorable year of grace, 1744.

If you go down to some tarn or slow-running brook, and push aside the duckweed which covers the surface like a thick green carpet, you will probably see attached to the submerged leaves and stems, little balls (scarcely the size of a small pea) of a green jelly-like substance; probably you may not. In either case you had better bring home a small quantity of the plant in a rubber-bag or something equally water-tight, and arrived there place it at once in a jar of water. Here you must leave it for a few hours, at the end of which you will have the pleasure of seeing in the place of those little green balls a narrow cylindrical animal, rayed at one end with from six to ten tentacles. As you watch, maybe a little Cyclops, or water-flea, comes flitting by; instantly one or more of those tentacles close round it, and then force it unresistingly into an orifice in the centre of the rays. You have seen a *Hydra viridis* catch and eat its unwary prey. And now, with the animal in front of us to refer to on all power is provided; by the process of gradually changing the position of the suctorial foot. You may have the pleasure of seeing it slowly creep up the side of the glass vessel and launch off along the the surface of the water, the sucker-like foot projecting a little above, and the body dependent underneath, as is usual with it. Under a lens we perceive that there is an opening amid the restless arms, leading into a cavity. The tentacula are placed rather lower than this mouth, which is protruded a little in the form of a snout (*hypostome* or *oral cone*). The body cavity is wide at the commencement, and from

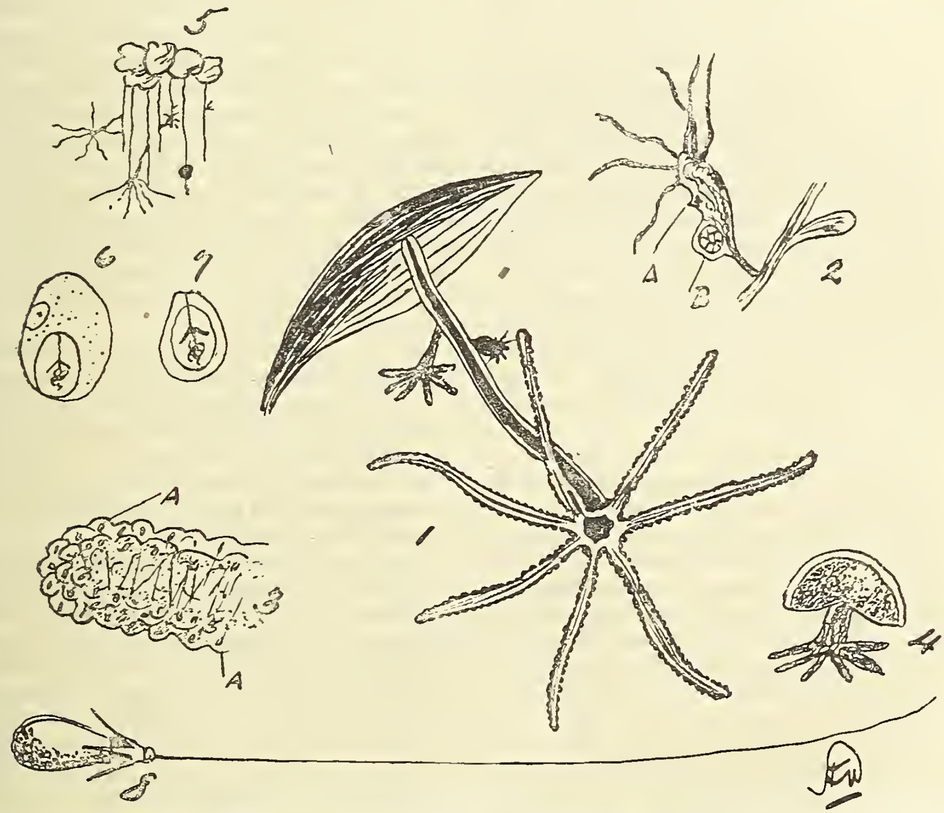


Fig. 57.—1. *H. viridis*, greatly magnified. 2. *H. viridis*, showing A, spermatic capsules (wall organs), and B, ovarian capsule (female ditto). 3. Portion of more magnified, and showing A, nematocysts (in situ). 4. Young Hydra bursting from ovum. 5. Hydras on Duckweed (nat. size). 6. Stinging capsules. 7. Ditto, in size. 8. Ditto, exerted.

points, we will proceed to consider its structure and economy, not a dry subject by any means. My classical readers will no doubt remember the dragon of the Lernean marshes in Argolis, which Hercules was sent to kill. As fast as he struck off one of its heads, two sprang up in its place. This dragon was called Hydra, and from it our little animal takes its generic name. The specific, *viridis*, of course explains itself. If we examine the extended animal closely, we shall see that it is about half-an-inch long, and is apparently fixed to the leaf or stem by its base. It is not, however, *permanently* fixed. Locomotive it a narrow canal runs to the base. You look for an opening at the posterior end in vain. "What!" you say, "how does the creature rid itself of its digested food?" Oh, a simple matter enough; it uses its mouth as an anus; an unusual proceeding, I grant you, but nevertheless a fact. There have been some who have tried to prove the existence of a true anus, but their efforts and statements have not been confirmed. The sides of its body appear smooth when the creature is fully extended, but when only partly so the skin seems to wrinkle, conveying to the eye a crenulated appearance. The tentacula which fringe the mouth are hollow, as is the body, linear or slightly tapered, and roughened at intervals with whorls of tubercles. They are filled in the interior with an albuminous, oleaginous substance, and at fixed places this substance swells out into nodules arranged in a spiral line, of which more anon.

If we now make a transverse section across the body, we notice that there is the large central cavity (*archenteron* or *digestive cavity*) before-mentioned, and which is surrounded by a double circle of cells. The outer layer is called the *ectoderm*, the inner the *endoderm;* that is, outer skin and inner skin. Between the two there is a thin, apparently structureless, supporting membrane, known as the *intermediate layer*. The cells of the ectoderm are of a curious shape, something like a pear, the large end being external, and the pointed end touching the supporting membrane. But it will be readily understood that intercellular spaces must occur between these pointed ends of the internal portion of the cells. These spaces are filled up by a mass of smaller cells of no particular shape, they being so crowded together that to retain any primary shape would be impossible. The endoderm cells are large, very irregular in shape, and of a granular appearance. One end of each cell touches the intermediate layer, while the other is directly within the archenteron. The outer portion of each cell contains chlorophyll-coated globules thus giving the green colour to the animal, from which is derived its specific name.

The digestion (or indigestion ?) of a Hydra is extremely interesting. The internal portions of the endodermic cells are each provided wilh a long tapering process called a *flagellum*, and, besides this, in many cases the protoplasm is pushed out into the archenteron, forming what are known as *pseudopodia* or false feet. Now, when the food is passed by the tentacles into the mouth, and so into the cavity of the body, it comes in contact with a digestive substance secreted by the endoderm. This digests, to a certain extent, the contained food, leaving, however, portions which it is unable to digest. These latter it takes up by means of its pseudopodia, and draws them into the endodermic cells. Here, it seems, they meet with a more powerful digestive juice which completely reduces them to a state of fine division, and from where the nutriment is ultimately diffused throughout the rest of the cells. But while all this is going on the flagella never cease from agitating the food, and distributing it about the archenteron, so that every cell shares in the work; and then afterwards, as before remarked, excrementitious matter seeks exit through the mouth, and, what is more, finds it. Such a method of digestion as is outlined above is termed intracellular digestion. Before we go any farther, sections of the tentacles should be made, when it will be seen that their structure is homologous with the body, and of which they are merely outgrowths. But connected with them are some peculiar organs which we must not omit to notice. Distributed about each tentaculum are what appear under the microscope little warts, and embedded in their substance small bodies of a shape akin to a soda-water bottle. Each one of these minute organs is filled with fluid and is encircled at the neck inside by several barbs directed backwards. Coiled up in the interior is a long delicate filament, and at the top there is another one projecting outwards, stiff, and apparently immovable. These constitute the organs of defence, or, scientifically, *nematocysts*. The method of capture is this: a small animal comes swimming by, and in so doing accidentally collides with the extended tentacles, thus touching one or more of the stiff hairs just spoken of. Instantly the neck of the vessel is pushed out, and not only one, but numbers transform their tentacula into spiny masses, and thus the roughened surface enables the prey to be grasped firmly while the long thread does its deadly work. The fluid injected by this latter is very poisonous, and of a nature that paralyses the animal undergoing treatment, so that the Hydra may the more easily get it into its mouth, especially if the capture be a large one, for oftentimes it will be found with a worm struggling in its tentacles.

But it is singular to note the animal's instinct of rejecting unsuitable or harmful food. Should a grain of sand or other foreign matter touch any of the numerous short stiff hairs, before-mentioned, which plentifully bestrew the surface of the tentacles, it does not attempt to evert the long deadly filament, for when one of these threads is everted it cannot be drawn back again but drops off.

As before stated, the Hydra can move slowly along on its foot by the emittence of pseudopodia. The ectodermic cells of the pedal disc secrete a clear, tenacious gummy substance, possessed of great adhesive powers. When the animal wishes to move quickly it progresses after the manner of the common looper caterpillars, *e.g.*, by stretching out its body to the utmost, and fixing itself in advance by its mouth or tentacula, and then loosening its posterior hold. Either a forward or retrograde motion can thus be made.

In a natural state the Hydra can reproduce itself by budding or *gemmation*. A small tubercle appears on the animal's body, and gradually grows and expands a set of tentacles, and becomes in all respects similar to its parent, except in size. For some time it remains attached, meanwhile growing and feeding. At last its foothold has become so slender that a slight effort frees it from its parent, though it is not unusual for them while still attached to develop others from their own surface. The sexual method of multiplication may only take place during the summer months. At this time the male organs (*testes*) are found near the mouth, and consist of from eight to twelve rounded prominences. Each one consists of a sac whose walls are constructed from the ectoderm cells, and whose interior is formed of the interstitial cells which fill up the spaces caused by the tapering off of the ectoderm cells to the supporting lamina. These interstitial cells now constitute germinal ones, and develop into spermatozoa, resembling those of mammalia, except for the tails, which are undulate. They are liberated by the bursting of the apices of the cells.

Near the foot a large projection arises. This is the ovary. At first it consists of many germinal cells, but later on of only one, which is now called the ovum. The spermatozoa reach this latter by the vibratile motion of the tail, and impregnation takes place. Subsequently the ovum is detached from the body, the sac becomes ruptured and the young Hydra escapes.

The most surprising thing connected with the Hydra, however, is the power of reproducing lost parts, and this it was that caused such excitement when Trembley announced his discovery. If the body be cut into two or more parts, provided each severed part contain ectoderm and endoderm cells, the parts will supply their complements. Thus, sever a Hydra into two portions by a transverse cut; the lower will produce a new pair of tentacles, the upper a new foot and archenteron. You may cut it into a hundred pieces, and each part will reproduce the parts necessary to form a complete animal and continue to live as though nothing had happened. Slit a Hydra lengthwise through the tentacles and down to the foot, but without quite detaching the two parts. If left alone they will unite and form a perfect being again. Keep them asunder and two Hydras will be perfected on one foot. Slit a Hydra upwards to the base of the tentacles and keep the two portions apart; two bodies will be formed surmounted with but one pair of tentacles. Put the body of one into the mouth of another, keep them in position, and they will firmly unite and form a single animal, distinguishable from others only by the double number of tentacles. Cut a tentacle off and a new body and the remaining tentacles sprout from it. This extraordinary power is very wonderful, but never in a natural state does it employ this method of "fission" for reproducing its kind. It was formerly reckoned that a Hydra could be turned inside out like a glove, and continue to live and digest its food in this condition; but more modern researches have disproved this statement and shown it to be a fallacy. Such, then, is an outline history of what is veritably a green water-dragon.

BOTANY has made rapid advances within the last twenty years, and perhaps there is no cheap "Manual" published at that time now in active use except Dr. M. C. Cooke's "Manual of Structural Botany" (London: W. H. Allen & Co.), of which the 37th thousand (revised edition) has just been published. It contains fifteen illustrations.

SCIENCE-GOSSIP.

GERMS, poisonous and innocent, seem to be present everywhere. On their microscopic backs is placed the onus of a hundred diseases. A fresh one has just been added to the list. Tetanus, or "lockjaw," as that terrible affliction is more popularly called, is now proved to be due to the presence of a virulent micro-organism. Between the infliction of a wound and the development of lockjaw there is sufficient time to allow the spores of this minute organism to develop into bacilli, when the latter produce those distinctive features characteristic of this dreadful disease. The virulence of this organism is only equalled by its wonderful vitality. Thus a small fragment of wood was extracted from the ancle of a child who had died from lockjaw. This fragment was kept for eleven years, when a portion of it, by way of an experiment, was introduced under the skin of a rabbit, and the rabbit died immediately afterwards of tetanus. In the pus or yellow matter of the wound, made by introducing the splinter of tetanised wood, crowds of tetanus bacilli were found.

MANY of our readers are acquainted with the remarkable lens brought out by Mr. Dallmeyer during the present year, and which he calls "telephotographic." This long word simply suggests the invention of a lens which can photograph objects at a distance. For instance, at a recent meeting of the Camera Club, pictures were exhibited representing all the details of a building which had been taken at a distance of 500 yards. Two cameras seem to be necessary, one supplied with a long focus landscape lens, and the other with Mr. Dallmeyer's new telephotographic lens. In this way the flame of a common oil lamp placed twenty feet away can be accurately photographed. It is anticipated that before long this new lens will be applied to that deeply interesting department of modern scientific research—stellar-photography.

A NEW method of manufacturing glass vessels which will not break under sudden changes of temperature is announced; the plan adopted being to make the article with an inner layer having a lower co-efficient of expansion than the outer layer. Articles made in this way seem to have the useful qualities of Bastie's "hard glass," without the tendency to spontaneous explosion; and the making of them is in most cases easy, as the operator first takes up on his blowpipe a mass of the glass with the lower co-efficient of expansion, and the more expansive glass is now taken up on the outside of the first by dipping in another pot.

CHEMISTS rush in where angels fear to tread. To them there is nothing hidden that shall not be revealed. In their researches and experiments the word "sacred" is unknown. Here is an instance of their daring. For ages the most valuable precious stone in the world has been the diamond. Of course it was known that this crystallised bit of carbon could be burnt like an ordinary piece of coal, if it were subject to a sufficiently high temperature, for Sir Isaac Newton demonstrated this more than two hundred years ago. Apart from this fact, however, the diamond was regarded as peerless amongst precious stones. It was the hardest object in the whole world of matter. Nothing could corrode it or destroy it. Alas! a German chemist, Mr. Luzi, has just demonstrated that diamonds can be corroded by heating them for half an hour in the melted matrix or "blue ground," in which they are usually found in the South African diamond-fields; and it is thought that the process depends upon the reduction of the melted matrix or magma at the expense of the carbon of the diamond.

One of the most wonderful places in the whole world, for number and variety of metallic minerals is the "Broken Hill" district of New South Wales, recently noted for the bitter losses of the strike quarrel there. We possess at least a score of small specimens of various minerals from one particular mine in that neighbourhood. When the geological formation of all these various minerals, their origin, mode of occurrence, etc., comes to be written (as one day it must be) it will prove as interesting as the volume issued by the United States Government upon the Sierra Nevada district of Western America, out of which one of the owners, Mr. Mackay, is taking £25,000 a week. A new form of silver ore has just been discovered in the Broken Hill district. It consists of hard, horny particles of ore, containing traces of gold and silver, associated with traces of iodide, bromide and chloride. It has long been suspected by some eminent mineralogists that sea-water, in a highly heated form, or otherwise, has had a good deal to do with the deposition of precious metals, and the composition of this new silver ore will undoubtedly strengthen the belief. The water of the sea contains a good many metals, which its chlorides have enabled it to dissolve. How many people know, for instance, that every cubic mile of sea-water contains fifteen tons of silver? The new silver ore above referred to is found disseminated through beds of fine clay, which have been subterraneously heated, so as to resemble baked kaoline or biscuit-ware.

More than a quarter of a century ago a book was written by the Hon. Mr. Marsh, United States Consul at Florence, entitled "Physical Geography as Influenced by Human Action." It gave a long list of instances in which the indiscriminate cutting down of forests had affected the rainfall of countries. Climate is an exceedingly sensative thing, and every leaf on every tree, shrub, and plant influences it. Vegetation is a marvellous regulator of climatic conditions, particularly of rainfall. The latter is stayed and checked by the influence of the former. Cut down the forests of a country, and the rainfall becomes irregular; so, of course, does the volume and velocity of rivers, floods, and torrents. Such altered conditions bring about extremes of dryness and wetness. Let all the vegetation be cleared away and perhaps general aridity, and therefore sterility, are the results.

The subject of the earliest eruptions of Mount Etna has recently been discussed before the Paris Academy of Sciences. They commenced in the Upper Pliocene period, represented in England by the shell beds which form the Suffolk and northern Essex cliffs. From that particular period, before the appearance of man on earth, right through the great northern ice age, Etna has been a living volcano, through long periods of time, which, although a mere skin-deep part of the antiquity of our planet, probably extend over a quarter of a million of years!

A very interesting paper by Mr. Dickson has just been published, in which he shows how the ebb and flow of tides in the English Channel are affected by the shapes or main features of the coast-lines. Thus, bays with a western side run nearly from south to north, turn at a sharp angle, and lie open to the east. Even the circulation of the water as well as the temperature Mr. Dickson found was largely influenced by the conditions.

One of the most important physical discoveries of our generation was demonstrated by Professor Dewar before a brilliant audience assembled in the Royal Institution. This was no less than the liquefaction of atmospheric air. All gases except hydrogen have now by compression and extreme cold been artificially liquefied. The air we breathe was the last to hold out, but now we are in front of the possibility of a liquefied atmosphere. In addition to the pressure used to produce atmospherical liquefaction, a cold equal to 327° of frost had to be employed. The liquefied atmosphere is of a faint blue colour.

A very destructive earthquake occurred in the island of Zante on January 31st. The shocks were frequently repeated.

Australia is about to grow its own tobacco. It is surprising the colonies never thought of it before!

We are pleased to draw the attention of our archæological and geological readers to Mr. John Allen Brown's paper (illustrated) reprinted from the "Journal of the Anthropological Society," entitled "The Continuity of the Palæolithic and Neolithic Periods." Mr. Browne is well known as an excellent observer and ardent collector, and he makes out a very good case.

CIVILISATION has two sides to it—bright and dark. Science is just as likely to play in the service of the one as in that of the other, For instance, the other day Mr. Swan, the great electrician, declared that he had just seen electrical blow-pipes capable of melting the stoutest iron so rapidly that to melt into a fire-and-burglar-proof safe with this fatal instrument would be the work of only a few minutes, and would be both an easy and a noiseless operation. The only drawback to the burglar using such a scientific tool is that a 40-horse engine power is required before the electrical blow-pipe can work!

SWEET and aromatic odours have always been in request amongst mankind. Eastern nations especially have always been noted for their intense love of perfumes. Some years ago Professor Tyndall showed that sweet and aromatic odours were cooling to rooms; in other words, their presence bars out the heat-rays of the sun, allowing those of light chiefly to enter. An ether-spray of perfume kept up for a few minutes in a summer room too hotly heated by the sun has almost a magical effect in cooling its atmosphere, for the reason assigned by Dr. Tyndall. It has just been discovered that odours and perfumes are also an antiseptic—that is to say, protective against epidemic diseases in a very high degree. No wonder, therefore, that ladies instinctively put their perfumed pocket-handkerchiefs to their nostrils upon noticing a foul smell.

WE know that fungi grow best in the dark, whether that of night or of dark cellars, but it has only recently been discovered that those exceedingly minute microscopic fungi known as bacteria share the same habit. They cannot bear the light, for their deeds are evil. Consequently, if you desire to purify drinking-water from bacteria and other germs, admit as much light to it as possible. Some very interesting and valuable experiments bearing on this subject have just been carried on in Germany by Professor Buchner. Sunlight is destructive to germs; therefore, let there be more light. Even the powerfully infectious bacilli of typhoid fever, cholera, and other terrible visitations cannot stand more than one hour's exposure to direct sunlight. Professor Buchner cultivated these foul germs in vessels, some parts of which were exposed to the light and others protected by darkness. Those of the germs which survived were found gathered together in the dark nooks and and corners, just as a flock of sheep would be collected on a broiling hot summer's day beneath the shadow of a great tree.

THE earth rotates on its axis, although some people will speak of it as revolving thereon. To rotate is to spin round like a wheel; to revolve is to travel round along a certain path. Thirty years and more ago a very distinguished Austrian physician (Reichenbach) wrote a very remarkable book, which was translated into English, on "Odylism." This term is derived from a Greek name for a "path" or "road." He was strongly of opinion that all nervous patients, and even ordinarily nervous people, should lie with their beds arranged due north and south, so as to be coincident with the rotation of the earth. The experiments he carried out at the Vienna hospitals, as related by himself, seemed very wonderful and caused much attention at the time. He positively declared that highly sensitive nervous patients lying east and west in their beds did not get the same rest as those arranged as above. Notions widely apart sometimes strangely coincide. For instance, some engineers of eminence have recently published their opinions that the most favourable position for the rotating shaft of a stationary engine is north and south—that is, coincident with the earth's axis.

MANY Englishmen have thought any three-leaved plant would serve the purpose of a "shamrock," as it would illustrate St. Patrick's explanation of the doctrine of the Trinity. About the middle of March the question is frequently discussed as to which is the "true shamrock." Of course it is one of the trefoils, but even our English pretty little wood-sorrel has been honoured with the claim to the title, in this country at least. In Ireland the question as to which species of trefoil constitutes the true shamrock is anything but settled; but there seems preponderance of opinion in favour of the trefoil. The small yellow-flowered trefoil is a favourite for the honour of being the true shamrock. Irish botanists have been investigating the subject, when, after the characteristic fashion, it is found that certain counties vote for the white clover and others for the yellow trefoil!

AN American chemist has just published an account of his discovery of a lilac-coloured dye he has been able to obtain from an extract of chestnut wood, treated with alkalies and kept below 50° Fahr. in a stream of air for about ten hours. The solution obtained therefrom is of a clear, bright lilac colour, capable of staining both animal and vegetable fibres.

FOR the first time a special protective coating in the form of cocoa-cellulose is being used for the protection of naval vessels. The new American warship, the *Olympia*, is being coated with this material, which is of such a nature and so adapted as to at once close and make good any hole which a projectile may cut through it. This, at least, is what its promoters claim for it. The action of the cellulose in closing an aperture is largely due to the way in which it is fixed against the ship. Around the entire circumference of the *Olympia*, for instance, so far above and below the ordinary water-line, a tank about 14 inches or more in width is being constructed, into which the cellulose is to be put and imprisoned under a high pressure. When the projectile has cut its way through, the pressure of the cellulose being somewhat relieved in the area of the wound, this material at once expands upon the latter and effectually closes upon it.

THE second annual issue of "The Year Book of Science," edited by Professor Bonney, F.R.S., is now in a forward state of preparation, and will be shortly published by Messrs. Cassell and Company.

A SOCIETY has been just formed, to be called "The Malacological Society of London."

MICROSCOPY.

GUM THUS.—I had supposed that Gum Thus was procurable in England as well as in the United States; but it is not, as I learn from an enquiry in your December number. It is Gum Thus or Frankincense, and is got here from the tree of the pine. I procured it from the L. R. Barnard Chemical Co., dealers in dye-stuffs, chemicals, acids, oils, etc., at 58 Market Street, Newark, N.J., U.S. I dissolve in commercial alcohol, with moderate heat, and then pour it off from the sediment. To this, three parts, I add one part of Oil of Cinnamon. It is used like Canada Balsam, but dissolves in weak ammonia, alkali, carbonate of ammonia, soda or potash or borax. These can be used to clean the slides from superabundant medium. Those who have tried it, speak in flattering terms of it. It is of a high refractive index, makes diatoms come out well with an ordinary one-fifth, and resolves the *Amphipleura pellucida* with a one-twelfth immersion. The colour, lightish-brown, is in the way, but I will bleach it by-and-by. Cholorine does not bleach it well. Try it, is all I say.—*Arthur W. Edwards, M.D.*, 11 *Washington Street, Newark, N.J. U.S.*

NEW SLIDES.—We are pleased to acknowledge the receipt of two beautifully prepared slides by Mr. C. W. Maw, of Bradford, one the transverse section of the Lily of the Nile, and the other a similar section of the Ovary of Narcissus. Both slides are valuable teaching specimens.

ZOOLOGY.

THE BISCOBRA.—When I first arrived in India, I was posted to Gorakhpur. From the natives there I heard of a lizard which they called biscobra or biscopra; they described it as being something like the common house-lizard in shape, about 18 inches or 2 feet in length, of a blackish colour, and exceedingly poisonous. When I asked to be shown one, I was told that there were none in those parts. Europeans whom I asked, considered the whole thing a myth; and such became my own opinion after a short while. Subsequently, when I found that the natives regarded all lizards, even the common house-lizard, as poisonous, I thought that the biscobra might possibly be a real lizard, but that its poisonous qualities were mythical. However, when I was subsequently transferred to Azamgarh, Mirzapur, and Allahabad, I found the native story was always the same; there was such a thing, but there were none in those parts. So I again began to consider the whole thing as a myth, and an article in the "Pioneer" confirmed me in this opinion. The writer there stated that the biscobra had no real existence whatever; and that the origin of the belief was due to the Portuguese, who, when they saw cobras killed by the mungoose, believed that the latter was more venomous than the cobra, and so called it bis-cobra; subsequently, the natives hearing the Portuguese speak of a venomous animal called the biscobra, did not think that the speakers were referring to the mungoose, for which they have a word of their own (neola), and which they know is not poisonous. This seemed to me plausible enough, and most probably the true explanation. However, after this I was transferred to Banda, and there for the first time I found a difference in the story told by the natives. They said that the biscobra certainly existed, and was found in that district, although rarely; and they seemed to entertain some doubt as to whether it was really poisonous. They told me that a predecessor of mine, wishing to disprove this, had himself actually bitten by one, and no ill results followed, but this did not absolutely convince them, because it might be harmless to Europeans, and yet poisonous to natives. I asked to have one shown to me, but was told that it was too rare and uncertain in its localities to be caught to order. One day, when going to my office, I saw a lizard, which I at once recognised from the description as a biscobra, and at the same time, the origin of the name was evident. Bis-cobra, poison-head, two purely Hindustani words, and the reason for the name was obvious, as the reptile had a large, and very ugly, venomous-looking head. It was rather sluggish in its movements, but the intervening ground being very irregular, it escaped into a hole before I could catch it. The legs were rather long, and the body carried rather high. At the same time I do not think that the account in the "Pioneer" was necessarily entirely incorrect. It seems to me possible that the Portuguese hearing the natives speak of a four-legged creeping and very poisonous animal as existing, and being named biscopra, may afterwards, when they saw cobras killed by the mungoose, have believed that it was the animal referred to.—*J. R. Holt.*

CHEIMATOBIA BRUMATA AND HYBERNIA RUPICAPRARIA CONTEMPORANEOUS.—During a country ramble on the 30th of last January, I took both the above-named moths floating on the water of the same ditch within a yard or so of one another. Is this of common occurrence? In my own mind I always associate the first specimen of the former with the last worn *Himera pennaria*, and the last with the bringing in of the proverbial Yule-tide Log. In the same way I connect the first individual of the latter with the first genially-warm days of early spring. This is the first time I have ever seen them on the same date. For my own part I have never taken *brumata* after the 15th of December before the other day. *H. rupicapraria* seems very constant and regular in its appearance, (I have never taken the ♀ except by breeding), and may nearly always be found on his watery grave between January 30th and February 4th until the middle of April (14th). The following practical note may be found useful:—*To take moths, which have flown on water with their wings expanded, off water:* Push a large chip box under the water on one side of the moth to be procured, and raise it up under the moth, and so take a "box-full" of water on which the moth is floating. Next prick a hole in the bottom of the box and let the water drain off through this; the moth will then be left with wings still expanded on the bottom of the box, where it should be left till dry, which process, if alive, it will help on greatly of its own accord. But what is the attraction held out by water for winter and early moths, and why have they so strong a penchant for every ditch, pond, and puddle? Can it be, as my friend Mr. Douglas Chase, of Epsom, suggested to me some years ago, that the light, caused by the reflection of the moon in the water, is the attraction, in the same way as is a lamp or the proverbial "candle"? Certain is it that no moths are more frequently found on water than the Hyberniæ.—*C. Morley*, *The Museum*, *Ipswich.*

THE OLD ENGLISH BLACK RAT.—A fine specimen of the English black rat (*Mus rattus*) was caught in a flour-mill at Rotherhithe, which is now under preservation at the local taxidermist.—*A. S. Cook.*

COLLECTING AND MOUNTING SPIDERS.—In answer to Jas. Murray in December number, the best time for collecting spiders is the spring, summer, and autumn; in winter only a few species will be found. The localities, under stones, at foot of walls, amongst furze bushes for species of Epecixea, in fact, look everywhere you will, you will find spiders. The usual method of mounting is to pin them out and gum them on a strip of paper, and place them in a test-tube with spirits of wine, writing the name, where found, and date, on the strip of paper. The spider can be taken out at any time and examined. They will keep their colours very well in spirits. A good book on spiders is "Spiders of Dorset." A series of articles have also appeared in the "British Naturalist." I shall be pleased to give further information if J. Murray will write me.—*J. Moore*, *Birmingham.*

BOTANY.

HOW TO COLLECT RUBI.—In gathering rubi or roses, when several pieces are required from each plant, such as barren and fruitful stems, etc., so as to illustrate each one sufficiently, I have found much difficulty in keeping the gatherings from each plant separate, the prickles are so liable to get entangled, especially in a vasculum well filled during a long day's collecting. Tyings of fine cord are not very successful. Has experience suggested any good means for overcoming the difficulty?—*C. H. Waddell, Saintfield.*

DRYING FLOWERS.—I am much obliged for the kind replies to my last query as to the cause of the campanula dried in the book-cover retaining its blue, and especially thank Dr. Keegan for his careful examination of the question, but I see on one point—and I fear through cloudiness of expression—I have been misunderstood, for I never for a moment meant to suggest that the *paper had dyed the flower*, (if there was any dyeing in the question it would have been the flower that dyed the paper!)—but that there might have been some chemical in the paper that fixed the fugitive colour in the blossom. Further, in dyeing any woven fabric there is added to the dye some sort of mordant to prevent fading. The fading of some blues, and the steadfastness of others in drying flowers suggests, to my mind, that there may be some natural mordant along with the colouring-matter in some flowers and not in others, which it may be possible for scientists to discover yet. I think interesting experiments might be tried as to fixing the colour of flowers in drying, by steeping the drying-paper in very strong mordants, and, when perfectly dried again, pressing the blossoms in it and seeing if it had any effect in preserving the colour of the various flowers. Might it not, too, be something towards discovering if there were natural mordants in the vegetable world? There are so many blue flowers that retain their colour that it would be interesting to find for certain the difference between them and those that fade. All the violets retain their colour, from the pale "Marsh" to the dark Sweet-scented. I have always found, with J. L., that polished paper for drying flowers is far the best, and I find the paper usually sold for the purpose, the worst possible to use. If J. L. is in the habit of reading SCIENCE-GOSSIP, he may have seen a paper, signed I. G., giving a method of drying flowers, which I have always found very successful.—*I. G.*

BOTANICAL MONSTROSITIES FOUND DURING 1892.—The following are the monstrosities found in the above season new to me:—*Bellis perennis*—a splendid specimen, with peduncle quite half-an-inch in width, bearing a flower one-and-a-half inches in length, having the appearance of five fused into one.

Primula vulgaris—peduncle flat, double; calyx of ten segments, containing two corollas, one of which had ten divisions and ten stamens. *Saxifraga granulata*—having eleven petals. *Ranunculus repens*—with eight petals. *Ranunculus repens*—fasciated peduncle with numerous heads. *Rubus fruticosus* (?)—ten petals. *Plantago media*—a giant inflorescence with twenty-four heads, shaped like a crown, one-and-a-half inches in diameter. *Taraxacum officinale*—fasciated peduncle with two heads. *Garden Cabbage*—six petals. *Turnip in Seed*—fasciated stem, two-and-a-half feet in length.—*Edwin E. Turner, Coggeshall, Essex.*

OROBANCHE ELATIOR.—*Centaurea scabiosa* certainly is not the constant host-plant of this somewhat rare parasite. Looking up my note-book and herbarium, I find that in two years I found four specimens of elatior growing on the roots of *Trifolium pratense.* The specimen in my collection measures exactly fourteen inches. It is worthy of note that, while the flora of this valley is one of the richest in the county, it is sadly deficient in Orobanchaceæ. Several years ago my father found a specimen or two of *O. major* on the roots of the furze, and these, with the specimens of *O. elatior*, which I gathered in 1891 and 1892, represent all the recorded instances of specimens of this interesting order of plants found in this neighbourhood. Of course other parts of Cornwall, particularly the Lizard district, are more favoured.—*Fred. H. Davey, Ponsanooth, Perranwell Station, Cornwall.*

MICRO-FUNGI.—I had somehow overlooked the reprint of Dr. Cooke's "Rust, Smut, Mildew," in 1886, but, on enquiry, find it is *only* an exact reprint of the *fourth* edition, and "revised and enlarged" refer to alterations in 1878.—*J. A. Walker.*

SILLGREEN.—In reply to J. Halsey's query, "sillgreen" is the name by which the common houseleek (*Sempervivum tectorum*) is generally known in Oxfordshire. The word is probably a corruption of "sengreen," which name is also applied to the same plant. The word appears to mean a plant which remains green throughout the winter, and is the same as "sinngrün," the German name for *Vinca minor.*—*J. Rose, M.A., Oxford.*

GEOLOGY.

THE "CELESTIUM."—Our young people are "hose-piped" with science. They catch it unexpectedly at every corner; but they can no more take up sixteen sciences at a time than the late John Bright's omnibuses could go four abreast through the late Temple Bar! Nevertheless (largely on the generous and thoughtfully worked out Froebel system of teaching great subjects to students), we do not hesitate to say that the best means of vividly presenting the phenomena of our solar system is the "Celestium," or patent astronomical calendar, for

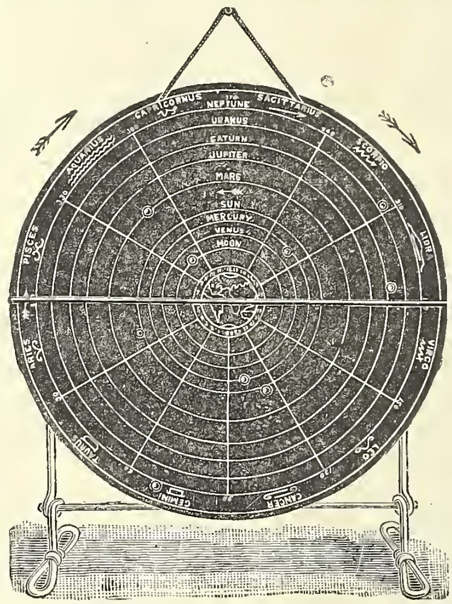


Fig. 58.—The Celestium.

recording (in miniature) the daily and even hourly positions of the heavenly bodies as they pass through the signs of the zodiac. No good school can afford to be without this ingenious and simple apparatus.

PRESSURE-METAMORPHISM.—This was the subject of an important paper recently read at the Geological Society, by Professor T. G. Bonney. The author described the results of study in the field and with the microscope, of some thin dykes in the calc-schist group, much modified by pressure; and some larger masses of green schist which appear to be closely associated with the dykes; also some other pressure-modified greenstone dykes of greater thickness than the first. The specimens were obtained, for the most part, either near Saas Fee or in the Binnenthal. These results, in his opinion, justified the following conclusions:—(1) That basic intrusive rocks, presumably once dolerites or basalts, can be converted into foliated, possibly even slightly banded, schists, in which no recognisable trace of the original structure remains. (2) That in an early (possibly the first) stage of the process the primary constituents of the rock-mass are crushed or sheared, and thus their fragments frequently assume a somewhat "streaky" order; that is to say, the rock passes more or less into the "mylonitic" condition. (3) That next (probably owing to the action of water under great pressure) certain of the constituents are decomposed or dissolved. (4) That, in consequence of this, when the pressure is sufficiently diminished, a new group of minerals is formed (though in some cases original fragments may serve as nuclei). (5) That of the more important constituents hornblende is the first to form, closely followed, if not accompanied, by epidote; next comes biotite (the growth of which often suggests that by this time the pressure is ceasing to be definite in direction), and lastly, a water-clear mineral, probably a felspar, perhaps sometimes quartz. (6) That in all these cases the hornblende occurs either in very elongated prisms or in actual needles. Professor Bonney brought forward a number of other instances to show that this form of hornblende may be regarded as indicative of dynamo-metamorphism! so that rocks where that mineral is more granular in shape (cases where actinolite or tremolite appears as a mere fringe being excepted) have not been subjected to this process.

WILL you kindly correct rather an important printer's error in my note in January SCIENCE-GOSSIP? I was made to say that what seemed to be "*first* remains" had been found at Streatham. This is nonsense, and should, of course, be *fish remains*. Probably my writing was at fault.—*Edwd. A. Martin.*

NOTES AND QUERIES.

A BOTTLE JOURNEY.—The Director of the Sydney Observatory has called attention to a remarkable journey made by a corked bottle, sealed with pitch, in which was contained a paper with the following words:—"Ship *Saida*, on voyage from Sydney to Auckland. All well on board. Fresh N.E. Lat. 40° 18′ S. Long. 157° 39′ E." The date is almost washed out, but appears to be March 11, and this is confirmed by the fact that the *Saida* left Sydney March 7. The interesting part of it is that the bottle found its way, against a strong current, through twelve degrees of latitude and four degrees of longitude, on the coast of Australia in Lat. 28° 4′ S., two miles north of Tweed River, where it was found, February 10, 1892, just eleven months after it was thrown into the sea. From what we know of the currents, which set strongly to the south along the coast of Australia, it seems impossible that it could have travelled direct. Probably, therefore, it was carried eastward by the current, which in that latitude sets in the direction of the coast of New Zealand; the current then turns northward, and probably carried the bottle on to the neighbourhood of Norfolk Island, and thence still northward on to New Caledonia, until it got into the current setting thence on to the coast of Australia. A journey, without deviation, of at least 2500 miles in 355 days, or upwards of seven miles a day, and doubtless the bottle, subject to all weathers, made many deviations, which made its course very much longer, therefore all the more surprising.

THE MINAH BIRD.—I have a Minah bird who has not been very well, and I am desirous of learning if there is any special food he should get.—*Harry Plenderleath, Jun.*

SILLGREEN (p. 46) = Houseleek. See SCIENCE-GOSSIP, 1882, p. 165; "Dict. Engl. Plant Names," p. 431.

SOUTH AMERICAN INSECTS.—In no country in the world is there more variety and beauty; nowhere are there species of insects of larger size and of more brilliant colours than in Brazil. The great mass of the beetles are indeed inferior to those of tropical Africa, India, and Australia; but it is in the lovely butterflies that the Amazonian forests are unrivalled, whether we consider the endless variety of the species, their large size, or their gorgeous colours. South America is the richest part of the world in this group of insects.—*Dr. Hartwig.*

THE LAND-RAIL (CREX PRATENSIS).—The occurrence of the corn-crake in the winter months, as reported in SCIENCE-GOSSIP for February, has, I think, been noted by several naturalists in different parts of the country on previous occasions. I have in my possession the two following authenticated accounts of the capture of this bird late in the year. One was shot by my father on the meadows at Bramford many years ago (about thirty), either on December 24th or 26th, and the second was secured at Leiston on December 16th, 1872, but I have not the name of the person who killed it. In Babington's "Birds of Suffolk" no mention is made of the whooper (*Cygnus musicus*) in "district four," in which district Bramford is included. I should therefore like to chronicle the occurrence of two old birds and four cygnets on the flooded meadows at Bramford and Blakenham. I succeeded in creeping within forty yards of the birds, and I observed them from that distance through field-glasses. If I had had any further doubt as to their identity, their loud "whooping" call would have satisfied me as to the species to which they belonged. They lit on the water near Messrs. Packard's works at Bramford early on the morning of January 27th, and remained till two o'clock on the 28th, when they flew off in a north-westerly direction. They were again heard in the neighbourhood during the night of the 28th, but had disappeared on the following morning. There are several pairs of tame swans on the Gipping, and these birds strongly resented the intrusion of the whoopers, driving them away whenever they drew near the main stream. A gentleman who has known this river for fifty or sixty years, and who is well-known in the eastern counties as a naturalist, informs me that he has never known wild swans on this river before. Several pairs of Bohemian waxwings have been shot this winter in Suffolk, one of those large flights which sometimes visit East Anglia having probably come over this winter.—*Laurence Creaghe-Haward, Bramford, Ipswich.*

"SILLGREEN."—In answer to Mr. J. Halsey's query, the name should be Salvegreen, in Somersetshire corrupted into Silogreen, hence Sillgreen. The common house-leek is the plant intended. The juice of the leaves bruised and mixed with an equal quantity of cream, was used as an application to eruptions on the face, etc. My mother, a native of Wiltshire, knew well, and put to practical use, the healing properties of the house-leek. — *Oscar A. Steeds.*

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

You cannot do better for your friend than get him Dr. Henri Van Heurck's recently-published book, "The Microscope" (London: Crosby Lockwood & Son), price, we believe, £2 2s., noticed in the February number of Science-Gossip.

E. H. Tugwell.—"Our Common Fossils and Where to Find them," originally appeared in Science-Gossip, spread over a few years, but the volume under that name, since published, is a very considerable enlargement of the articles you refer to, with a great number of additional illustrations.

P. O. T.—We know no better manual for students commencing the study of microscopic fungi than Dr. M. C. Cooke's book on the subject, with coloured illustrations, which are hardly required on account of the graphic descriptions now published, we believe, by Messrs. W. H. Allen & Co., Waterloo Place, London.

Scientific Words.—The following might suit F. P.:—Stormonth's "Manual of Scientific Terms," or Nuttall's "Dictionary of Scientific Terms."

EXCHANGES.

Wanted, a small rectangular aquarium. State price and size, or exchange for mathematical instruments, fossils, etc.—E. A. Martin, 8 Buckingham Gate, S.W.

Wanted, Bell's "Birds of the Selborne District," Rev. Kelsall's "List of Birds of Hampshire and Isle of Wight," and Borer's "Birds of Sussex." Will exchange books.—Ernest F. Atkins, Clifton, Andover.

Wanted, books and papers on reptiles in exchange for natural history specimens, or works on the same subject.—Malcolm A. Smith, Byculla, New Malden, Surrey.

Crustaceans.—*L. maia*, *I. Dorsettensis*, *S. phalangius*, *G. strigosa*, *G. Andrewsis*, *P. depurator*, *N. Norvegicus*, *A. heterodon*, *O. elegans*, *S. endica*, *P. membranacea*, *G. equestris*. Wanted, other British specimens not in collection.—W. Dow, 124 Loch Street, Aberdeen.

Duplicates.—*H. cantiana*, *V. albida*, *H. cartusiana*, *H. virgata*, *V. alba*, *H. lapicida*, *Bulimus montanus*. Desiderata, *H. hortensis*, *V. olivacea*, *H. aspersa*, *V. grisea*, *V. unicolor*, *V. albofasciata*, *H. nemoralis*, *V. hyalozonata*, and offers.—Thos. S. Hillman, Eastgate Street, Lewes, Sussex.

What offers for 31 vols. of Jardine's "Naturalists' Library," first edition, with over 1000 hand-painted plates—scarce? Wanted, "Barrett's Magus, a System of Occult Philosophy," published 1801.—D. S. Stewart.

Fossils from all formations to exchange for others, recent foreign shells, echinoderms, etc., or for publications of the Palæontographical Society.—Fredk. Stanley, Edgar Road, Margate.

Wanted, a good working microscope, in exchange for silver English lever watch, compensating balance, extra jewelled and capped, first-rate time-keeper, in good going order. Mutual approval.—J. Batty, 1 St. Andrew's Villas, Princes Road, Hull.

Wanted, Hudson and Gosse's "Rotifera," in good condition. Will exchange a ⅙-in. micro. objective by Swift.—E. H. Tugwell, 6 Lewisham Road, Greenwich.

Marine shells from Lifu, Loyalty Islands, including rare species of Mitra, Latirus, Pleurotoma, etc.; also a few land-shells from same locality, for exotic land-shells not in my collection.—R. Standen, 40 Palmerston Street, Moss Side, Manchester.

Science-Gossip. For disposal, duplicate volume for 1881, bound in publishers' cloth, in excellent condition. Wanted in exchange, similarly bound volume for 1870, 1871, or 1876. The following odd numbers also offered: February, 1880 (one page incomplete), March, April, and August, 1883.—W. P. Quelch, 8 Eccleston Road, Ealing Dean, London, W.

Offered, British land, freshwater and marine shells, also a few well-set *S. ligustri*, *S. ocellatus*, *Populi*, *Bucephala*, *filipendulæ*, *Sambuscata*, *Ulmata*, *Maculata*, etc., in exchange for other insects, shells, and micro. slides not in collection.—W. D. Rae, 17 Stafford Street, Millwall, London, E.

Stanley's "In Darkest Africa," in twenty-two separate parts, all quite new and clean; each part cost 2s. What offers? Richd. B. Corbishley, Breck Road, Poulton-le-Fylde, Lancashire.

Offered, the very rare ant, *Ponera punctatissima*, Roger, living, or unmounted in spirit, in exchange for micro. slides or offers.—Geo. Parish, 124 Kingston Road, Oxford.

Geological specimens in exchange for insects.—C. J. Powell, 137 King's Road, Canton, Cardiff.

Offered, twelve monthly parts of Science-Gossip for 1889, ten parts for 1892, five monthly parts of "Field Club," and a lot of mounting materials. Exchange anything useful.—S. W. Heaton, 80 Frampton Park Road, South Hackney.

British insects for nuts, curious seeds, gulls, or curious insects from other countries.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

Lepidoptera collected in Sierra Leone, to exchange for other foreign lepidoptera.—W. G. Clements, Frindsbury, Rochester.

To German geologists. For exchange, fine specimens from carboniferous limestone, chiefly mollusca; also beautifully-polished sections of fossil corals. Wanted, good specimens from the Muschelkalk; also rough corals from the Devonian.—W. F. Holroyd, Greenfield, near Oldham.

I have diatoms for exchange, Champlain diatoms from Hatfield Swamp, N.J., in fresh water, but contains salt-water forms, as *Adinorychus Ralfeii*, and *Campylodiscus echenais*, Kearney, N.J., contains freshwater, brackish, and marine forms, Newark, N.J., and other gatherings from New Jersey, New Hampshire, Australia, and elsewhere. Send slide of any kind, or material, for exchange, to—Dr. Arthur M. Edwards, 11 Washington Street, Newark, N.J.

Pl. dilatatus, *Pl. glaber*, *L. glabra*, *L. truncatula*, *H. sericea*, *H. arbustorum*, *C. tridens*, *C. minimum*, and many others for exchange. Wanted, foreign shells, or any of Richard Jefferies' works.—F. C. Long, 32 Woodbine Road, Burnley, Lancs.

Rare eggs of British birds, offered for good books, atlas, telescope, field-glass, or the commoner eggs, side-blown, one-hole.—J. Ellison, Steeton, Yorks.

Wanted, Leighton's "Lichen Flora of the British Isles," and Lindsay's "British Lichens." State requirements.—F. Coles, 53 Brooke Road, Stoke Newington, London.

Kensington Jubilee envelope, with card. Offers requested in foreign stamps and entires.—Mrs. Skilton, 21 London Road, Brentford, Middlesex.

Wanted, living examples of *Testacella haliotidea*, *T. scutulum*, *T. maugei*, *T. bisulcata*, and *T. pecchiolii*, also live examples of any slugs from North of Scotland, Isle of Man, and the Channel Islands.—Walter E. Collinge, Editor "The Conchologist," Birmingham.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The American Naturalist" (January).—"Reports of the Eastern Counties' Coal-Boring and Development Syndicate, Limited."—"The Microscope," December (Washington).—"American Monthly Microscopical Journal" (New York).—"Twenty-Third Annual Report of the Entomological Society of Ontario.—"Insect Life" (Washington: Government Printing Office).—"The American Naturalist," February, 1893.—"The Midland Naturalist" (London: Simpkin Marshall & Co.).—"Astronomy for Every Day Readers," by B. G. Hopkins (London: George Philip & Son).—"Le Micrographe Préparateur" (Paris: M. J. Tempère, 168 rue St. Antoine).—"The Sussex and Hants Naturalist," January and February, 1893.—"The Botanical Gazette" (Bloomington: Indiana).—"The Earth's History," by R. D. Roberts, M.A. (London: John Murray).—"The Naturalist's Journal"—"The Statesman"—"The Observer" (Portland: Conn.).—"Report of the Felstead School Natural History Society" (Chelmsford: "Essex County Chronicle" Office).—"The Naturalist," February (London: Lovell Reeve & Co.).—"Nature Notes" (London: John Bale & Sons).—"The Annals and Magazine of Natural History" (London: Taylor & Francis).—"The Geological Magazine" (London: Kegan Paul, Trench, Trubner & Co.).—"The Victorian Naturalist" (Melbourne: Walker Macy & Co.).—"Feuille des Jeunes Naturalistes"—"Natural Science" (London and New York: Macmillan & Co.).—"The Game Birds and Wild Fowl of the British Isles," by Charles Dixon (London: Chapman & Hall), etc., etc.

Communications received up to the 10th ult. from: G. M.—F. H. D.—A. T.—R. W.—J. H.—A. H. S. W.—T. H.—S. S.—T. W.—G. W.—G. W. N.—E. R. S.—F. C. L.—J. E.—F. C.—J. W. W.—W. E. C. E.—J. H.—M. S.—R. G.—J. R.—G. S.—J. S.—E. H. T.—P. O. T.—D. S. S.—F. B. D.—P. E. W.—C. A. W.—K. G.—H. A. M.—W. H. B.—F. P.—W. C.—S. C.—F. H. P.—J. H. R.—P. A. S.—E. A. M.—E. E. T.—T. D. A. C.—T. S. H.—E. A. M.—W. D.—J. B.—M. A. S.—P. O.—E. A. A.—L. C. H.—W. F. H.—S. L. M.—W. G. C.—S. W. H.—C. J. P.—W. H. W.—R. B. C.—J. R. H.—W. D. R.—W. P. Q.—J. M.—Dr. A. M. E.—G. P.—F. H. D.—F. S.—O. A. S.—G. P.—J. C. M.—R. S.—C. D. R.—J. B.—G. W. M.—etc., etc.

RECENT ASTRONOMICAL DISCOVERIES.

By F. W. LEVANDER, F.R.A.S.

THE date of the invention of the telescope is involved in some obscurity, but we shall, probably, be not far wrong if we say that the instrument was first used about three hundred years ago, rather less than more. In its original form it consisted of two pieces of glass, with curved surfaces, one placed at either end of a tube. The refracting telescope of the present day consists, essentially, also of two similar glasses, similarly placed, but whereas a spectacle lens probably constituted the first object-glass, the instrument has increased so enormously in size that the object-glass of the large equatorial in the Lick Observatory at Mount Hamilton, in California, has a diameter of thirty-six inches. Even this will shortly have to yield the palm to another of forty inches, to be erected in the Yerkes Observatory, near Chicago.

In 1610, Galileo, the philosopher of Padua, was viewing the planet Jupiter through one of these newly-invented instruments, when he was struck by the appearance of three small but very bright stars in its immediate vicinity. He at first thought they were merely some of the fixed stars, though his attention was drawn to a peculiar resemblance they seemed to bear to one another, and to the fact that they were all in nearly a straight line. He was still more astonished to find, in the course of the next few nights, that their positions, relatively to Jupiter and to one another, were not always the same. More than that, he sometimes saw a fourth. Occasionally only one of these bright little bodies was visible, at other times his telescope showed him two, or three, or four, but never more than four. Galileo had discovered the satellites of Jupiter. This discovery led to another, that light occupies an appreciable time in passing through space. For upwards of two hundred and eighty years these four small bodies, the diameters of which are respectively, beginning with satellite I., that is, the one nearest Jupiter, 2390, 2120, 3480, and 2970 miles, were considered the only companions the giant planet had in his journey round the sun. The possessor of even the smallest telescope is able to see these moons; indeed under certain peculiar circumstances they have been seen by the unaided eye.

The light-grasping power of a telescope is quite distinct from magnification, the latter being dependent on the relative focal lengths of the object-glass and the eye-piece, whereas the former is determined by the size of the object-glass. The light-grasping powers of two telecopes bear the same relation to each other as the squares of the diameters of their object-glasses. The light received by, say, a four-inch telescope is four times as much as that received by a two-inch. We can thus form some idea of the enormous amount of light gathered at the focus of the great Lick telescope.

It was on the night of September 9, 1892, that a keen-eyed observer at Mount Hamilton was scrutinizing the immediate neighbourhood of Jupiter with this glass, when he detected a minute speck of light near one of the satellites. As the planets pursue their respective paths in the heavens, they sometimes appear to pass close to various stars. These can be identified by tbe examination of star charts. In the course of a short time, the distance between the planets and the stars seen in their proximity will exhibit a change. For some unexplained reason Mr. Barnard had some suspicions about this speck of light, he therefore continued his observations on the nights of September 11, 12, 13, 14, and 16, and found that, when this little body was visible, it was always somewhere near Jupiter. It was not one of the fixed stars, for it travelled with, and round, Jupiter. This tiny body proved to be a fifth satellite, never going beyond 67,000 miles from the surface of its primary (about one-fourth of the distance of the nearest of Galileo's satellites), and travelling round it in an elliptic orbit, in a period of about 11 hours 57 minutes—about two hours longer than it takes the planet to rotate once on its axis. Few telescopes in the world will show this fifth satellite; it has been seen by only three instruments in America and the same number in Europe, none having a smaller aperture than twenty-two inches. Our knowledge of both the Martian and Jovian systems has thus been enlarged by American observers; the two moons of Mars having been discovered at the Washington Observatory in 1877. The diameter of this newly discovered—but probably very old—satellite of Jupiter is so small that it cannot be determined by observation.

We must remember that Jupiter is placed at a very great distance from us—though this distance is a mere nothing as compared with that of what we, in the present state of our knowledge, consider the nearest fixed star. When Jupiter is nearest to us it is about 400,000,000 miles distant, whereas the distance of α Centauri, the nearest fixed star, is such that light travelling at the rate of about 189,000 miles every second, takes $4\frac{1}{3}$ years to come from it to us. The difficulty of seeing this little moon is due, not merely to its small size, but also to the fact that its distance from its primary never takes it away from the glare of the planet, and, moreover, it does not shine by its own inherent light, like the stars. Our knowledge of it is, therefore, exceedingly limited. It is known that the attraction of Jupiter has diverted comets from their paths; can this be the remains of a comet that has been entangled in his system, and has had its original course altered so as to revolve round him?

The discovery of Jupiter's fifth satellite was made by means of the largest refracting telescope in the world. Another very important discovery had been made eight months previously by the aid of what one might almost call the smallest in the world, a mere pocket telescope. So much, as has been rightly said, depends on the man at the little end of the instrument.

On a few occasions, what are called "new," or "temporary," stars have been observed—stars, which for some reason or other have sbone more or less brightly, and for a longer or shorter time—where previously no star was known to exist. In order to detect these, unless they burst suddenly into great brilliancy, like the celebrated temporary star which was seen from November, 1572, to March, 1574, a considerable acquaintance with star charts, and the actual appearance of the heavens, is necessary. In this manner, and by the aid of only a small glass, Dr. Anderson, of Edinburgh, had gained such a knowledge of the positions of the stars in the constellation Auriga, that he one night saw a star that he was able to say he had never noticed before, and which was not marked on the excellent star maps he used. He unfortunately allowed some days to elapse before he made his discovery known. He then adopted the unusual course of sending a notice of it anonymously, on a postcard, to the Royal Observatory at Edinburgh, nor did bis name transpire till some little time afterwards. Immediately on the receipt of his postcard, on February 1, 1892, the news therein contained was communicated to the principal observatories of the world, and the importance of the discovery was soon manifest. Nova Aurigae at once became an object of diligent and careful examination. The telescope showed that its brightness varied in a peculiar manner, but beyond this the instrument indicated nothing. Furtber discoveries were, however, made by the spectroscope. By means of prisms or a grating, that is, a surface of glass or speculum metal on which are ruled a very large number of exceedingly fine lines, many thousands to the inch, the light proceeding from a star or other luminous body can be analysed and its nature determined, as well as the amount of the approach or recession of the body, if it is in motion. The light proeeeding from Nova Aurigae, when spread out into a little strip in the spectroscope, exhibited peculiar appearances, the interpretation of which is not yet quite settled. Various theories have been propounded, but the matter is still *sub judice.* On August 20, the object presented the appearance of a small, bright nebula, with a stellar nucleus of the tenth magnitude. Not a clear night passes without photographs of some parts of the heavens being taken, and on some of these plates being afterwards examined, it was found that the image of the star had impressed itself on some plates taken at the Harvard College Observatory, Boston, twelve times between December 10, 1891, and January 20, 1892. By comparing the Harvard plates with some taken at Heidelberg, it would appear that the Nova increased from below the eighth magnitude to above the fifth, between December 5 and December 10, 1891.

Had not Dr. Anderson known the positions of the stars in Auriga so well, had he not been such an accurate and painstaking observer, the discovery of this wonderful object would not have been made by him, or at any rate it might have been delayed beyond January, 1892.

Towards the end of last November it was possible, with a powerful telescope, to see no fewer than seven comets at the same time. A comet does not generally attract popular attention unless it is very bright or large, or so situated with respect to our line of sight as to appear very large. None of these seven comets fulfilling any of these conditions, none attracted public attention. Only one presented any peculiarity. This was discovered on November 6, by Mr. Holmes, of Islington, who was well acquainted with the constellation Andromeda. On that night he was observing, with his twelve-inch reflector, that group of stars for a special purpose, when he detected a nebulous object which was not charted. It was soon found to be a comet, and it, also, created a sensation in the astronomical world. Comets move in parabolic, hyperbolic, or elliptic orbits. To determine the shape of a comet's orbit, the direction of its motion, its inclination, and the time of its perihelion passage, at least three accurate observations of its place at different times are required. When Comet Holmes was first seen, its apparent motion was very small; consequently, the difficulty of determining its orbit was very great. One calculator produced an orbit, in accordance with which the comet was rapidly approaching the earth, and some little alarm was occasioned in certain quarters by this announcement, while another physicist assigned to it a motion in the opposite direction. Both of these orbits have since proved to be erroneous.

The light proceeding from this comet varied, though not exactly as one would have expected, but its changes in apparent size are, at present, inexplicable. When, theoretically, it should have subtended a smaller angle than it did at the time of its discovery, it was really more diffused, and, more wonderful still, on January 18, it presented the appearance of a nebulous star of the eighth magnitude.

I have said that photographs of the heavens are being constantly taken. The time of exposure varies with the object to be photographed; if a picture of stars is required, the exposure may be only for a few seconds, but a spectrum or a nebula may require an exposure of some hours. This is possible by means of an equatorial driven by accurate clock-work. Should it be desired to photograph a comet, the rate of whose apparent movement differs from that of the stars, the rate of the clock-work must be adjusted accordingly, or the comet will appear on the plate only as a trail, or sort of long patch. In a photograph taken at Hammersmith on October 18, there is a peculiar object which at first was taken for Comet Holmes. Authorities, however, differ; some think it is the comet, others look upon it as a mere imperfection. The first actual discovery of a comet by photography was made on October 12, by Mr. Barnard, the discoverer of Jupiter's fifth satellite. The plate was exposed for 4 hours 20 minutes and, on being developed, a very peculiar patch was observable. Shortly afterwards the comet was visually discovered.

When one views the sun through a telescope, the eye being of course properly protected from the excessive heat and light, dark spots (as well as other peculiarities) are frequently seen on its surface. These are not scattered irregularly over the disc, but are usually confined to a zone extending for about 35° on either side of the solar equator. They vary very much in size and appearance as well as in their persistence. Some are visible for only a short time, while others are much more permanent, and occasionally spots are seen for several solar rotation-periods of twenty-five days each. Some are so enormous that they may be seen without a telescope, either by using a dark glass, or through the intervention of a thin cloud. To be seen by the naked eye, they must be at least three times the size of the earth, and subtend an angle of at least 50″ of arc —the mean apparent diameter of the sun is about 30′. They appear singly or in groups. No one knows their origin; no one can predict either their appearance or, when they have once shown themselves, their disappearance. There is, however, roughly speaking, an eleven-year period of maximum and minimum frequency. A sun-spot usually consists of three parts—the spot proper, which is dark, its penumbra, which is much lighter, and its nucleus or centre, which is the darkest part of all, but is not always distinguishable. Some spots have a comparatively small penumbra, whereas others are surrounded by a penumbra of enormous size, presenting most varied and fantastic shapes. When at the edge of the sun's disc, spots have sometimes been seen as actual depressions or notches on the limb.

A magnificent group of spots was observed November 15, 1891, and was watched through five semi-rotations. On its first appearance it extended in area over 400 millionths of the sun's visible hemisphere, and was soon distinguished by a beautiful network of bright interlacing bridges, which divided its nucleus into a perfect archipelago. By February 13, its area had increased to 3500 millionths, or, measured in miles, its length may be taken as 162,000, and its breadth as 75,000; this extensive group had, on March 5, diminished to less than one-fifteenth of that size, and was not seen after March 17. When it was at its maximum in February, a great magnetic disturbance took place on the earth, as so frequently happens during the formation or existence of large solar spots. That there is a close connection between these two phenomena can hardly admit of doubt, but what, exactly, that connection is, science has yet to discover.

Besides spots, light streaks called faculae are seen on the sun's disc. These are not so easy to observe, except when near the edge, owing the brightness of the sun. Round the circumference of the disc are seen prominences, as they are called—huge incandescent masses, extending sometimes for thousands of miles from the sun's surface, of varied shape and continuance. As the sun is globular and rotates on its axis, there is no reason to think that these prominences do not exist all over its surface, their visibility at the edge only being accounted for by the relatively darker background. Nor is it unlikely that the faculae are really prominences. By employing a certain part only of the solar spectrum, and by means of a very ingenious apparatus devised by himself, Professor Hale, of the Kenwood Astro-Physical Observatory, at Chicago, has succeeded within the last few months in obtaining photographs of the sun, such as have never previously been seen: faculæ all over the disc, spots and prominences—all obtained simultaneously with one short exposure.

The United States have been well to the fore in recent astronomical discoveries. It was there, too, that about three years ago the discovery was made that the duplicity of stars, too close to be optically separated, could be detected by means of the spectroscope. We hear of wealthy citizens of the States devoting their dollars to the establishment and magnificent equipment of astronomical and physical observatories, and we hear of the good results obtained thereby. It is not from the other side of the Atlantic that we hear of physicists clamouring for state aid to enable them to ventilate their fads, and batten on the already overburdened tax-payer.

A CURIOUS GROUP OF COCCIDÆ—THE LECANIODIASPINI.

By T. D. A. Cockerell.

On the twigs and leaf-stalks of the Akee-tree (*Cupania edulis*), in Kingston, Jamaica, one meets with numerous greenish-yellow scales, slightly convex, and more or less circular in outline. On examination with a lens, they are seen to have a remarkable pinkish fringe; and if the insect is further studied by the aid of caustic soda and the microscope, it appears that the scale encloses the oval body of the female, which is so degraded in its characters as to possess neither legs nor antennæ. Not so the larvæ, however; these have legs and stout antennæ, and are able to move about.

This remarkable Coccid belongs to a group which Ashmead* has called *Lecaniodiaspini*. This is not by any means identical with the *Lecanodiaspidæ* of Maskell, though it is the group so called by Targioni-Tozzetti. Mr. Maskell refers *Lecanodiaspis* to *Lecanodiaspidæ*, together with such genera as *Vinsonia*, *Ceroplastes*, *Carteria*, etc. *Planchonia* he places in *Coccidinæ*, subdivision *Acanthococcidæ*; and *Pollinia* and *Asterolecanium* form a new subdivision, *Cryptokermitidæ*, of *Hemicoccidinæ*.* *Pollinia* is stated to have a "single fringe," but in Ashmead's generic synopsis it is said not to be fringed.

* "Generic Synopsis of Coccidæ," p. 100.

Five genera have been admitted as constituting the group; and up to the present time thirteen species have been described. The purpose of the present paper is to indicate two new species, and give such an account of the others that they may be recognised.

One of the genera, *Pollinia*, may be distinguished from the others because it lacks the double fringe. Of the others, *Lecaniodiaspis* is recognised by the presence of antennæ in the adult female, the legs being absent. There now remain three supposed genera called *Asterolecanium*, *Planchonia*, and *Asterodiaspis*. The last was separated by Signoret on the ground that the male resembled that of the *Diaspinæ*. If this were so, the separation would be well warranted, but from the close resemblance of the female to that of the other two genera, it is hard to avoid the conviction that there must have been some mistake. It seems probable, indeed, that the three last-mentioned genera may have to be merged in one: in this article, *Asterolecanium* is kept distinct, but *Asterodiaspis* is merged in *Planchonia*.

POLLINIA, Targ.

(1). *Pollinia pollini*, Costa.

This is the *Coccus pollini* of Costa, and the *Pollinia costæ* of Targioni-Tozzetti. The whitish scales are found adhering to the bark of olive-trees in Europe, and according to Signoret, resemble in superficial appearance those of a *Diaspis*. The much degraded female is oval in outline.

Recently, as is related in "Insect Life," vol. iv. p. 347, this species has been accidentally imported into California. It was found there on some olive-trees which had been brought from Italy five years before.

LECANIODIASPIS, Targ.

(2). *Lecaniodiaspis sardoa*, Targ.

Found on *Cistus* in Europe; the scale is oval, and of a greyish-yellow colour. The adult female has short thick antennæ composed of nine joints, of which the second and third are the longest.

(3). *Lecaniodiaspis yuccæ*, Riley MS, Towns.

Found on *Dasylirion* and *Yucca* in New Mexico, U.S.A. It has not been formally described, but

* See Maskell's "Account of New Zealand Scale-Insects" (1887).

Professor Townsend* has given characters by which it may be recognised. The scale is round, hemispherical, and whitish, 3 to 4 millim. diameter: it has a median longitudinal carina. It infests the upper sides of the leaves of the host-plants, chiefly at and near their bases.

ASTEROLECANIUM, Targ.

(4). *Asterolecanium bambusæ*, Boisduval.

Found originally on cultivated bamboos in Algeria: but I have been so fortunate as to meet with it in some numbers on the stems of a bamboo growing by the hotel at Moneague, Jamaica. The ♀ scales (Fig. 59, N) are about 3 millim. long, oval, slightly

(6). *Asterolecanium palmæ*, n. sp.

A very small species found with *Fiorinia fioriniæ*, to which it has some superficial resemblance, on leaves of cocoa-nut palm, collected by Dr. Sinclair near Montego Bay, Jamaica. The scale (Fig. 59, P) is lemon-yellow, with a well-formed fringe, and long pink filaments at each end. The fringe consists of waxy filaments, mostly in pairs, diverging from one another near their ends (Fig. 59, Q). The shape of the scale is elongate, narrower than *A. miliaris*.

(7). *Asterolecanium aureum*, Boisd.

Found on *Maranta vittata* in hothouses. It is of a golden yellow colour.

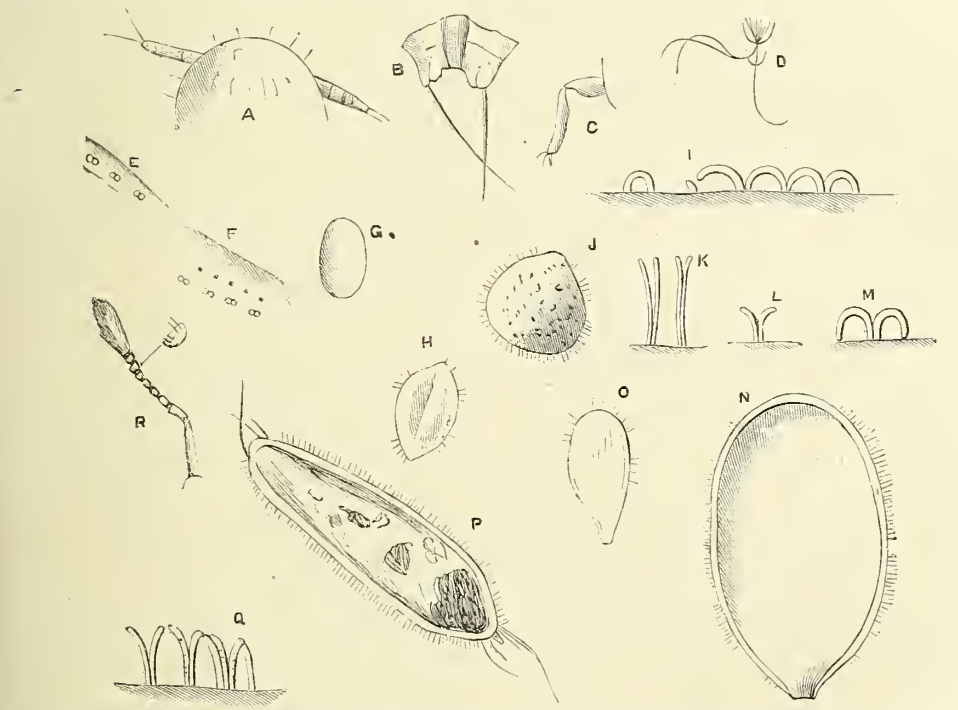


Fig. 59.—*Planchonia oncidii*: A, cephalic portion of young larva, to show antennæ. *Planchonia pustulans*: B, posterior end of body of adult ♀; C, middle leg of young larva; D, mouth parts of adult ♀; E, F, abdominal and thoracic marginal glands of adult ♀; G, egg; H, immature scale; I, fringe of immature ♀; J, mature ♀ scale; K, fringe of mature ♀; L, M, figures to illustrate nature of fringe. *Asterolecanium bambusæ*: N, adult ♀ scale; O, supposed ♂ scale. *Asterolecanium palmæ*: P, adult ♀ scale; Q, fringe of same. *Parasite*: R, antenna. (All magnified.)

convex, pale greenish-white. The slightly pinkish fringe is very distinct, but easily falls off. The male scale is apparently undescribed. I found many little flask-shaped scales, only 1 millim. long, (Fig. 59, O) which I suppose to be those of the male.

(5). *Asterolecanium miliaris*, Boisd.

This was found on different cultivated bamboos in Algeria, and is much like the last, but more elongate, and keeled.

* "Scale-Insects in New Mexico" (1892), p. 13.

PLANCHONIA, Sign.

(8). *Planchonia fimbriata*, Fonx.

This species occurs in the neighbourhood of Aix, on *Coronilla glauca*. It is oval, light yellow, with a distinct fringe. The larva has 6-jointed antennæ.

(9). *Planchonia pustulans*, Ckll.

A West Indian species, briefly indicated as *Asterodiaspis pustulans* in Journ. Inst. Jamaica, Aug., 1892, p. 143, but now first described in detail.

The scale is slightly convex, in outline nearly circular, with a slight inclination to be triangular, less than 2 millim. diameter (Fig. 59, J). Its colour is greenish-yellow, with the fringe pinkish. Immature scales (Fig. 59, H) are broadly oval, and more or less longitudinally keeled. The surface of the scale presents many gland orifices, some single, others double (figure-of-8), which secrete waxy rods, similar to those which compose the fringe. Round the margin is a distinct row of figure-of-8 glands, secreting the fringe; these, on the thoracic margin, are accompanied on their distal side by a row of simple glands.

The adult female is oval, attenuate towards the hind extremity, and showing on the dorsum many round gland-spots. The segmentation is still indicated, though indistinctly. The mouth-parts are ordinary (Fig. 59, D). The posterior extremity (Fig. 59, B) shows distinct tubercles emitting the rather stout caudal setæ. The colour of the female, as seen after immersion in caustic soda, is bright crimson.

In a young individual (second stage) the antennæ and legs are present, and yellow in colour. The fringe is colourless, and remarkable in appearance (Fig. 59, I), resembling a number of hoops placed side by side. This appearance is produced by the bending-back of the wax rods, so that they diverge from one another, and the ends of each pair meet the ends of the nearest rods of the neighbouring pairs on the margin of the scale. In the adult scales, the rods of each pair only slightly diverge (Fig. 59, K); a further degree of divergence is seen in the marginal rods of *Asterolecanium palmæ* (Fig. 59, Q); and the extreme is reached in the second stage of the species under consideration (Fig. 59, M).

The larva, which turns scarlet on being placed in caustic soda, is long oval, and has no fringe. The legs are set far back, the first pair being about one-third of total length from the anterior margin. There is a tendency for the cephalic portion to be distinct. The segmentation of the abdomen is distinct, and the caudal tubercles emit moderately long filaments. The legs are rather long; the femur of the middle pair (Fig. 59, C) is broad and notched, that of the first pair narrow and normal. The antennæ appear to have six joints; they are stout, the last joint not at all accuminate, but rounded, emitting two long hairs, and two or three shorter ones.

The eggs (Fig. 59, G) are oval, greenish.

This species occurs on a variety of plants, and is very destructive. In British Guiana it is found on the akee, on *Castilloa*, etc. In Kingston, Jamaica, I find it abundantly on akee, infesting the leaf-stalks and twigs, and producing a pustular appearance. Dr. Riley informs me that it is found in Florida, on *Hibiscus*. In Montserrat it is abundant and injurious: Mr. C. A. Barber sent me specimens collected in that island on pigeon-peas and white oleander. It is also found on oleander in Jamaica.

It has been confounded with *P. fimbriata*, which it resembles. Except the difference of locality and food-plant, and the double row of figure-of-8 glands in *fimbriata*, there would not be much difference so far as one could judge from published descriptions; but Dr. Riley informs me that there are in the collection at Washington, specimens of *P. fimbriata* received from Lichtenstein, and that there is no question as to the distinctness of *P. pustulans*.

A yellowish-red mite was found among some scales taken from an akee in Kingston; it may very likely be predatory upon the eggs. There is also a Chalcidid parasite. Some specimens on oleander, in Kingston, show parasite-holes, but the parasite was not obtained. In the case of a parasite of this species in Montserrat, I was more fortunate, as I obtained a fragmentary imago. This was with the scales on pigeon-peas, and although it no doubt belongs to the sub-family *Encyrtinæ*, the genus can hardly be ascertained. I made the following descriptive notes:—

Parasite of P. pustulans from Montserrat. Thorax brown, minutely reticulated. Head brown. Abdomen shovel-shaped, colourless. Antennæ pale (Fig. 59, R), club pubescent, funicle joints with whorls of hairs. Middle tibia with a moderately long stout spur, and a small short one. Wings hairy, stigmal vein moderately long.

(10). *Planchonia oncidii*, n. sp.

Found in Kingston, Jamaica, on orchids. I first received it on a leaf of *Oncidium tetrapetalum*, from Dr. Henderson; later, I found a plant of *Broughtonia sanguinea* in Dr. Strachan's garden, badly infested by it. It closely resembles *P. pustulans*, but is, I am convinced, distinct. The food-plants are different, and the scale is a little smaller, and bright yellow, with the shrivelled body of the female appearing dark brown at one end. The fringe is rather long, and pale pinkish. In shape, the scale is inclined to broad-oval, and there is a slight median keel.

The young larva, which is quite active, is elongate-oval, bright yellow, with the segmentation fairly distinct. The cephalic margin shows a few hairs. The antennæ (Fig. 59, A) are stout, the last joint emitting two very distinct airs of moderate length. The terminal segment emits two caudal filaments as in other species, but these are short, not *much* longer than their distance apart, and much shorter than the maximum width of body. Legs well-developed, tarsi with slender but long-knobbed hairs. The larva, as in *P. pustulans*, has no fringe.

The *Lecanium epidendri* of Bouché seems to be a *Planchonia*, and it may even be the same as the present species. The female scale is said to be rounded, depressed, greenish-yellow, the margin ciliated; the male is dark yellow, with the head brown. It was found on *Epidendrum cuspidatum*.

(11). *Planchonia epacridis*, Maskell.

Found in New Zealand, on *Leucopogon Fraseri*. It is a pretty species, the scales appearing half dark green and half bright yellow, and the fringe silvery. The shape is oval, tapering posteriorly.

(12). *Planchonia styphelia*, Maskell.

On *Styphelia* and *Leptospermum* in Australia. The female scale is whitish, with a faint greenish tinge.. The male is yellow, with iridescent wings, and long caudal filaments. It is figured by Maskell in Trans. N. Z. Inst., 1891, Pl. III., f. 16.

(13). *Planchonia arabidis*, Licht. MS., Sign.

On *Arabis stricta* in France. It is smaller than *fimbriata*, and of a clearer colour, with a pretty whitish fringe.

(14). *Planchonia hederæ*, Licht.

Found in France, and destribed in Bull. Soc. Ent. France, 1880. In 1882 the name was changed, without sufficient reason, to *valloti*.

(15). *Planchonia quercicola*, Bouché.

Small greenish scales infesting the buds of oak-trees in Europe. I have received English specimens from Mr. Newstead. It has also been found at Washington, U.S.A., but on imported oaks.

The male is yellowish, more or less inclining to brown, with the antennæ and legs almost black, and the wings transparent whitish-grey.

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WOODLAND WANDERERS, OR THE MYCETOZOA.

By James Saunders.

[*Continued from p.* 8.]

A BRIEF description of the appearance of the mycetozoa in the fruiting stage, will be helpful to those who wish to observe them in the field. In the immature condition they are often of a different colour from that of the mature. They sometimes present the appearance of minute white beads (Comatrichia) scattered over the surface of decayed wood or bark. In this state they show in striking contrast to the hair-like black stalks on which they stand. In a day or two the heads change to a dusky brown. Others again appear as minute black beads glistening as though covered with varnish. A slate-coloured species (Cribraria), which eventually assumes a yellowish hue, may occasionally be found on fallen pine-logs. In the early spring a generally distributed species may be observed on decayed tree-stumps, etc., of a lovely pink (Reticularia), the sessile heads of which are about the size of peas. These are not uncommon in Epping Forest and Wanstead Park. Less frequent than this is a species of a scarlet hue, which, when mature, shows as a small group of closely compacted cylindrical dark-brown heads (Tubulina). This may be sought on fallen willow-trunks, near to brooks in moist meadows. A much more common species (*Trichia Jackii*) presents the appearance of a patch of sessile white heads, that when ripe become a bright yellow. One of the most attractive appears as rows or scattered heads, like tiny pink beads (*Trichia fallax*), but they quickly change to a clayey or ochreous hue. The last-mentioned species was first noticed by the writer on a small island in a secluded park, where many trees had fallen and had been allowed to lie unmolested. These formed a perfect chaos of broken branches and prostrate trunks, over which the still living trees cast a dense shade, the whole surrounded by a damp atmosphere which just suited the needs of these moisture-loving creatures.

It should be mentioned that if specimens are collected in an immature state, it is desirable to keep them under an inverted wet glass, for a few days, so that the contents of the sporangia may become fully matured, as, unless these are so, it would be difficult or impossible to determine the species to which they belong. Many disappointments have been experienced by collectors from not taking these precautions. The mature sporangia, or *peridia* of some authors, have usually well-marked and permanent colours. A whole series of them, including about one-third of the known British genera, have *opaque white heads*, the whiteness being due to the presence of lime, which is deposited on the surface during the process of ripening. This group is hence the *Calcareæ.* Most of these contain violet or dark-brown spores, and it is desirable always to examine the colour of the spores, as this is an important point in classification. This is easily done either by rubbing a sporangia between the fingers, or, better still, upon a piece of white paper. It will be seen that not only the lime-coloured heads, but many other species, have *violet or brownish-violet spores.* The genera with these characters comprise about one-half of those found in this country. It is desirable to see that the specimens collected really contain spores, so that one may be spared the experienee of the writer, who, on one occasion, found what at first sight appeared to be an interesting group of heads, with the resemblance of an operculum to each. On a careful microscopic examination of the contents of the supposed sporangia, no spores could be detected, but instead only a watery fluid. Upon a re-examination of the general appearance of the specimen it resolved itself into a group of eggs of one of the lepidoptera. As some consolation for the disappointment, one felt that true knowledge is attained, not only by the observation of facts, but also by the rectification of error. Our national collections also arc not absolutely frec from similar specimens.

Amongst the genera with dark-coloured spores is a small group that are like the reed mace (*Typha*) in miniature. These may either be grouped, like a tiny forest, with separate stems and closely-compacted heads (Stemonitis), each head composed of an intricate network of most delicate threads, or both stems and sporangia may stand singly (Comatrichia).

A very abundant and generally distributed genus has bright yellow spores (Trichia) and capillitium. This network or capillitium was called "wool" by some of the descriptive botanists of last century, and it certainly has a strong resemblance to a tiny tuft of woolly fibre when seen projecting from the ruptured capsules. These may often be observed in compact groups of an inch or two in diameter, on rotten tree-stumps, or scattered over the foliage of mosses, and liverworts that grow in these situations. This does not imply that the mycetozoa have fed on the living tissues, but that they have been nourished on the underlying decayed vegetation, and have crept out to the surface when ready to form their spores, so that these may be distributed by the wind.

Yet another group, that is by no means rare, in which both spores and capillitium vary in colour, and are either a pale yellow or range from a delicate flesh-tint to a deep crimson (Arcyria).

The presence of this woolly substance is always helpful in field-work, in determining whether a specimen under observation is a Mycetozoon or not. But if an observer is in doubt it is always advisable to secure an unknown form, for careful examination at home, as otherwise a rare species may be cast aside as worthless. It should be borne in mind, however, that about one-fifth of the known British genera have no capillitium, so that the contents of the sporangia are only spores. But even these in some cases have a delicate framework (Cribraria) which lines the wall of the sporangium and gives it support. At first this external skeleton may be mistaken for a true capillitium, and hence may deceive the novice as to the true position in classification of the species under consideration. Close observation will, however, soon enable the observer to distinguish between these two organs.

The contents of the sporangia form most interesting objects for the microscope. As they are so minute it is necessary to use a moderately high power, say, $\frac{1}{4}$ or $\frac{1}{6}$th inch object-glass. It has been estimated that a single head of *Comatrichia typhina** contains a thousand million spores, and these are in addition to the delicate network of the capillitium that forms, as it were, an intricate framework around which the spores are clustered. There are other genera in which a number of sporangia coalesce so as to form a community (Reticularia) of an inch or so in diameter in which the spores are so numerous that figures fail to represent them. In many species these spores, although so minute, have their walls ornamented. These markings are due to thickenings of the cell-wall, and may consist of dots, warts, spines, or other figures, and may be either regularly or irregularly distributed over the surface. In other species the walls of the spores are smooth.

The hair-like threads that form the capillitium present many peculiarities of structure. These are usually so constant that next to the colour of the spores they form the principal basis of classification in modern systems. But even in these there are not always hard and fast lines of demarcation, for some specimens present combinations of character that are assumed to belong to closely-allied species. These threads may be simple or branched; combined into a network, or have numerous free ends, and they may be united to the walls or to the central columella. Their ornamentation is often very beautiful, and of most intricate designs. These markings may consist of spirals, spines or cogs, and are due to external thickenings of the walls. In this respect they differ from the elaters of Jungermanniæ, which have the spirals coiled up in the interior of the cells. Some few species show affinities with mosses in the possession of an operculum; others approach the fungi, through the Lycoperdons, in the presence of a capillitium, and the whole group exhibits a relationship with the animal world, by the motile amœba-like cells, which precede the formation of the plasmodium.

The student of the mycetozoa would find a peculiar fascination in the subject as his knowledge of it increases, and as it is comparatively "An Open Field," he would find plenty of opportunity for original research. Nor need his observations be limited to any one period of the year, as they are to be found at almost all seasons, extreme of heat and cold being most detrimental to their development. The pursuit would lead him into some of nature's quietest haunts, and also furnish him with material for the most advanced microscopical investigation.

Possibly it may not be presumptuous to assume that some of our readers will be stimulated to commence the study of the subject. A difficulty would, however, present itself to the mind of the novice, as to how his specimens are to be named. It would be perilous to invite correspondence, fearing a deluge, but, so far as possible, assistance would be cheerfully rendered to any who may wish to form a practical acquaintance with the Mycetozoa.

For those who wish to pursue the subject further, reference is made to the following literature:—

"Mycetozoa," "Midland Naturalist," vols. from 1882, 1887, 1888.

"Myxomycetes of Great Britain," Dr. M. Cooke, 1877. "An Open Field," "Nature Notes," Mr. A. Lister, January, 1892. "Notes on Mycetozoa," "Journal of Botany," Mr. A. Lister, September, 1891. "Myxogastres," Mr. Geo. Massee, 1892.

Luton.

* See "Midland Naturalist," 1882.

A WONDERFUL EGG.

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

THE particular egg about which I purpose writing is not to be found in any of the famous collections on which oologists have spent fortunes, and for the acquisition of which museums have set apart large sums. No one ever spent upon it such fabulous sums as have been paid for an egg of the Great Awk or the extinct Dodo. Yet it is practically as seldom seen, and as little known, as any of the unique eggs which collectors covet so ardently and prize so highly.

We usually think of eggs as consisting of a yolk surrounded by albumen and enclosed in a hard shell made of lime. The eggs of birds and fowls are our types, but the egg before us has no chalklike shell. Most eggs, together with their shells, are formed within the body of the egg-bearing animal, but this egg differs from almost every other kind in this respect. It is true that the egg itself is formed as usual in the ovary, and passed through a tube known as the oviduct, but the shell is fabricated by the animal externally, and is slipped over the egg as it passes out of the oviduct and is about to be deposited. Eggs are very commonly laid in a nest more or less elaborately constructed, and it is a rare thing for only one egg to be laid during the season by each individual. It has been correctly surmised that the number of eggs laid by a bird or other animal bears a close relation to the exigencies and dangers which the young will be likely to encounter. Hence a pigeon lays only a pair of eggs, while the thrush deposits some half-dozen in its nest, and partridges, pheasants, tits, and other birds, lay from a dozen to a score. Then we find that herrings and other fishes lay enormous quantities of eggs as compared with many fresh-water species. The egg I am describing is never laid in a well-formed nest, and as a rule it is found at a considerable distance from its nearest neighbour. As it is not laid in the open air, on the branches of trees (as the eggs of many insects are), or on the surface of the soil, but in damp places under the bark of trees, under stones by streams and ponds, or deep down in the moist soil, special provision has to be made for its development amid such peculiar surroundings. If the eggs of a bird or fowl be varnished so as to exclude the air, or buried in soil at a considerable depth, the young will never be hatched; yet here is an egg which can only be hatched when it is kept moist and cool, and one which may be buried at a depth of some inches or even feet and yet retains its vitality.

Our egg is seldom more than a quarter of an inch in length, and as it is usually oval the shortest diameter is only about half the length. It was long ago pointed out that eggs almost invariably remain during the hatching period the same size as they were when first extruded; but here is a curious exception to the rule. We should look with amazement on a pigeon's egg which increased in size till it became as large as a hen's egg during the time when the mother bird was sitting, but this is exactly what happens in the egg before us. It both lengthens and widens, and we shall have to enquire how this is possible.

The naturalist is already well aware of the fact that when an animal regularly lays a large quantity of eggs of minute dimensions the offspring is almost invariably unlike its parent, and has to undergo sundry transformations, changes, and developments, before arriving at any degree of perfect resemblance to the adult form. Conversely, as in the case of birds, when a few relatively large eggs are laid, the young usually emerges with a strong resemblance to its progenitor. The reason is obvious. A good deal of material is needed within the egg in order that a perfectly developed brood may emerge, and when the parent is compelled, through the struggle for existence, to launch a bevy of young on the sea of life, it cannot possibly fill the pockets of each (to speak metaphorically) with the almighty dollar, or provide that its offspring shall be started in life as are the progeny of individuals whose dangers are fewer aud whose resources are more abundant. If we apply this argument to the egg in question we may conclude that its enemies are comparatively few. The colour of the horny egg-capsule is usually either a delicate olive-green or a light brown, and well harmonises with its surroundings. The egg is, relatively to the size of the parent, large, and the number deposited comparatively small, while the young on emergence is found to be an exact copy of the original, a perfect reproduction of the parent.

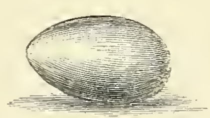

Fig. 60.—Bird's Egg.

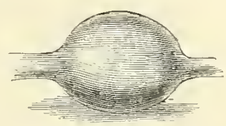

Fig. 61.—Egg of Worm. (Magnified.)

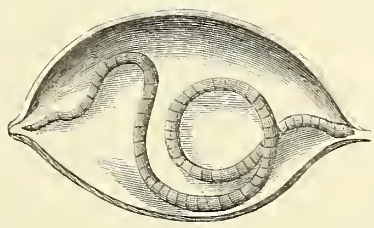

Fig. 62.—Egg distended by young worm ready to emerge. (Section highly magnified.)

It seems somewhat curious that an egg possessing so many peculiarities should have been almost absolutely ignored by scientific men and naturalists generally, the more so as it is easily obtained and readily examined. So far as I have been able to find during a long and extensive period of study, Swammerdam, who wrote the "Book of Nature," is almost the only observer who has devoted any attention to the systematic study of these eggs; but the result of his researches was such that he writes: "Among all the eggs of insects, of which I have various species in my collection, I know none more worthy of greater attention than these."

It will perhaps be thought that I have tried the patience of the reader sufficiently, and ought now to drop my parable, and state the name of the animal which owns this wonderful egg. A few years ago I should not have dared to name the despised earthworm. To let the public of twenty years ago know that you condescended to notice the worms of earth would be to signify your fitness for the asylum, but Darwin has changed all that, and now we are told by the author of "In Darkest England" that "more minute, patient, intelligent observation has been devoted to the study of earthworms, than to the evolution, or rather degradation, of the sunken section of our people." Each subjeet has its place, and we have no more right to ignore the one than the other. If we were by some calamity to lose this lowly population of mead and woodland, our beautiful, fertile land would in a single year depreciate in value to the extent of millions of pounds! Hence I am bold enough to mention the earthworm as the creature whose egg is a microcosm of the greatest wonder. The case which eontains the fluid-matter out of which the future worm is to be evolved is of a horny, not of a calcareous substance. It reminds us of the egg-capsules of the dog-fish found everywhere on the sea-eoast. Chemically it eorresponds almost exactly with our nails, and with the hoofs and horns of animals. It is cuticular in origin, that is, the skin, and not the blood, the spleen, or any other internal organ or substance is the agent in its formation.

Everyone knows that the finger-nails are most easily trimmed after the hands have been washed in warm water. The reason is plain. Horny substances absorb moisture, and swell in proportion to the amount taken up, at the same time becoming soft and pliable. Slight chemical changes produce greater or lesser degrees of hardness in the substance. Hence horny substances are not all alike hard, and the horny-capsule of the worm is tolerably elastic, so that when kept in a moist condition it can be slightly expanded by the internal pressure exerted by the growing worm. But how can the worm grow? The chick can become no larger than the shell-surrounded yolk and albumen will permit, but when the young worm is hatched it will very probably be an inch in length. Let us see how this contingency is provided for. The accompanying illustration will help to make the matter plain. If we took a small tube of gelatine, and placed within its eavity a tiny globule, we could secure the contents of the tube by drawing the two ends to a point. If now the globule could expand on the application of moisture it must either burst its case, eause it to expand in the direction of its shortest diameter, or force open the ends of the tube. Now the egg-eapsule of the worm can expand slightly, but not to a sufficient extent to allow the worm to reach full dimensions. Consequently the embryo gradually forces open the sealed extremity of the case, and thus paves the way for its ultimate escape, at the same time that it loosens its swaddling bands, and develops little by little into a perfect worm. While the beak of the embryo bird develops and hardens within the shell sufficiently to enable it to peck its way out of the calcareous covering, the worm has no such tool for opening its prison-house, and so these other means must be provided for its eseape.

It may occur to some observant reader that analogy to this is found in the case of the dung-flies' eggs, which are deposited with the horn-like projections upwards. In both cases if the eggs are removed from their moist lodging-place they shrivel and become lifeless. Worms again are not quite alone in the possession of the power to extend the egg-case during incubatiou. Huber long ago observed the same fact in relation to the eggs of ants, and those of certain saw-flies can similarly expand to meet the requirement of the growing grub within.

As the larvæ of various caterpillars are subject to the attacks of sundry deadly parasites, so I have found (what does not appear to have been observed before), that the eggs of worms are often rendered abortive by the invasion of a smaller worm. It is another illustration of the rhyme about "big fleas and little fleas." Whether the eggs of the parasite, which often exist in great numbers in the adult worm, pass with the ovule of the true worm into the capsule and then develop, living on the matter stored up in the egg-case, or whether the parasite finds its way into the egg after oviposition has taken place, is uncertain, but I believe the former suggestion to be the correct one.

It would occupy too much space, and to some readers at least prove uninteresting, if I were to detail the wonderful process which goes on within the egg-case. The life-history of the worm has been fully studied, and is replete with marvels. If an egg is examined when the young embryo is almost ready to emerge, it will be possible, through the semi-transparent and greatly-dilated case, to watch the movements of the worm, trace the current of blood along the elaborate system of vessels, and eventually observe the emergence of the baby annelid into the world.

There is much food for reflection in this curious egg, and now that I have preached my sermon I leave my readers to deeide whether accident or design will best aecount for the adaptation of this insignificant germ to its environment and uses.

WARNING ODOURS.

INSECTS which are protected by the possession of a disagreeable taste, require in addition some characteristic by which their enemies may easily and at once recognise them. Without this, they would be liable to be killed in mistake for some eatable species. In the case of day-flying insects, as butterflies, this warning is most readily given by a peculiar system of coloration. In the case of nocturnal insects this is not sufficient, and some other means must be adopted. Four devices suggest themselves: (1) a white or light coloration joined to a peculiar flight, (2) actual emission of light, (3) a peculiar noise, (4) a peculiar odour. As instances of the first three ways, I may give as probable examples: (1) *Hepialus humuli*, (2) fireflies, (3) the moths I mentioned in my first letter to this paper, as making a clicking noise. Unfortunately, the idea did not occur to me in time to verify the actual possession of a disagreeable taste in these instances. In the case of the fourth class, insects possessing a warning odour, there would obviously be an advantage in the odour being itself repulsive. In this case, we, knowing nothing of the taste, and perceiving the repulsive odour, would naturally think that the disagreeable nature of the odour was the protection, and overlook its warning character altogether. This is, I think, what has occurred in the case of the "flying bug" of India. This insect has a very strong odour, which most persons find exceedingly repulsive. When I first arrived in India, I was told that the insects were protected by their odour, and this seemed, on the face of it, very probable. Subsequently, I noticed that the smell was not quite the same in different individuals; this led me to observe it more carefully, and I was surprised to find that the repulsion which I at first felt, very soon disappeared, and I began to regard the smell as rather pleasant than otherwise. I got a friend to try it, with the same result; a resolute effort was needed in the beginning, but after a couple of hours the odour ceased to be disagreeable, and never again became so. This led me to think that if the insect was really protected by the smell, either its disagreeableness was more persistent in the case of animals, or it was not nearly so effective as supposed. One night one of these bugs flew into my mouth, and I noticed that it had a strong, acrid, and intensely disagreeable taste. This suggested to me that the real protection might be in the taste, and that the odour was merely a correlative variation, or a slight additional protection; the idea that it could be warning did not occur to me then. To corroborate this, I macerated a bug in sherry, and then tasted the wine; as I expected, it had a strong and very disagreeable taste, and a tendency to cause nausea. I also gave one to a tame lizard, which was accustomed to take insects from the hand; he seized it, but instantly rejected it, and for some time afterwards, violently shook his head, as though to get rid of some disagreeable impression.

While stationed at Karwi, I noticed an interesting fact connected with these bugs. During the rains they flew into my bungalow in swarms; I have seen my bed literally black with them. Large numbers of a large and handsome toad, of a yellow colour speckled with red, also came into the bungalow. The bugs appeared to be this toad's favourite food. Nothing else would touch them, but this toad appeared to eat nothing else, although there were plenty of other insects. This suggests a question. Was the protection valueless against this toad from the beginning, and acquired as a defence against other animals? Or was it in the commencement good against everything, and have the toads learned to disregard it comparatively lately?

J. R. HOLT.

NOTES ON NEW BOOKS.

THE Game Birds and Wild Fowl of the British Islands, by Charles Dixon (London: Chapman and Hall). It is a short time since we had the pleasure of noticing Mr. Dixon's delightful book on "The Migrations of Birds." He is a most diligent and enthusiastic writer on ornithology, and has devoted the whole of his still young and intellectually active life to this special subject. The work before us is larger, bulkier, and fuller than its predecessor, admirably printed on good paper, and abounding in excellent and artistic illustrations. It is a volume which ought to "catch on" to every sportsman-naturalist. Most sportsmen are naturalists without knowing it, although all naturalists are not necessarily sportsmen. Mr. Dixon's book not only gives a detailed account of all our native game birds and wild fowl, but also of species allied to them in every part of the world. It is the broadest in treatment of any ornithological work we know of; admirably written in good English, and deeply interesting to read. It runs to 480 pp., which are divided into the latest classified ornithological groups. There is also a full and convenient index. A work like this would be a veritable boon in a country house on a rainy or snowy day.

Extinct Monsters, by the Rev. H. N. Hutchinson, B.A., F.G.S., etc. (London: Chapman and Hall). To an old geological writer it is very delightful to welcome a clergyman to the ranks of geological literary scribes. It was so very different more than thirty years ago. Then, geologists were expected to expound "Genesis" to theologians, now theologians expound very original views of "Genesis" to geologists! No doubt it will all come right in time. Mr. Hutchinson broke his geological ground in the columns of SCIENCE-GOSSIP three or four years ago, and very naturally in verse? But there was a

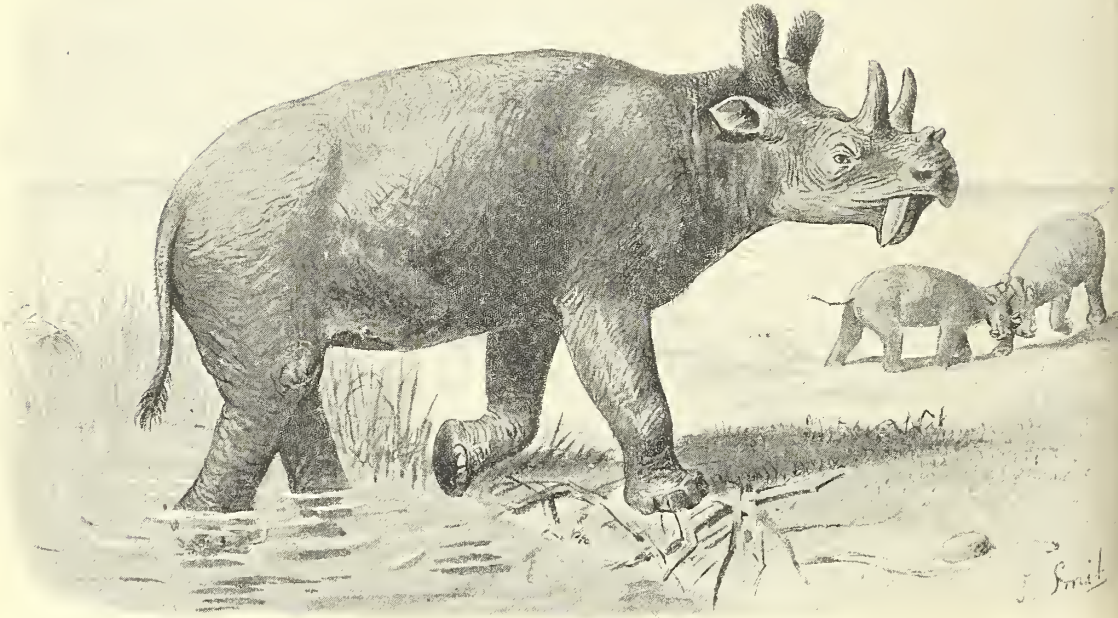

Fig. 63.—A now extinct Quadruped (*Tinoceras ingens*); length about 12 feet. (From Hutchinson's "Extinct Monsters.")

Fig. 64.—A carnivorous Dinosaur (*Megalosaurus Bucklandi*); length about 25 feet. (From Ditto.)

Fig. 65.—Steller's Sea-Cow (*Rhytina gigas*). (From Ditto.)

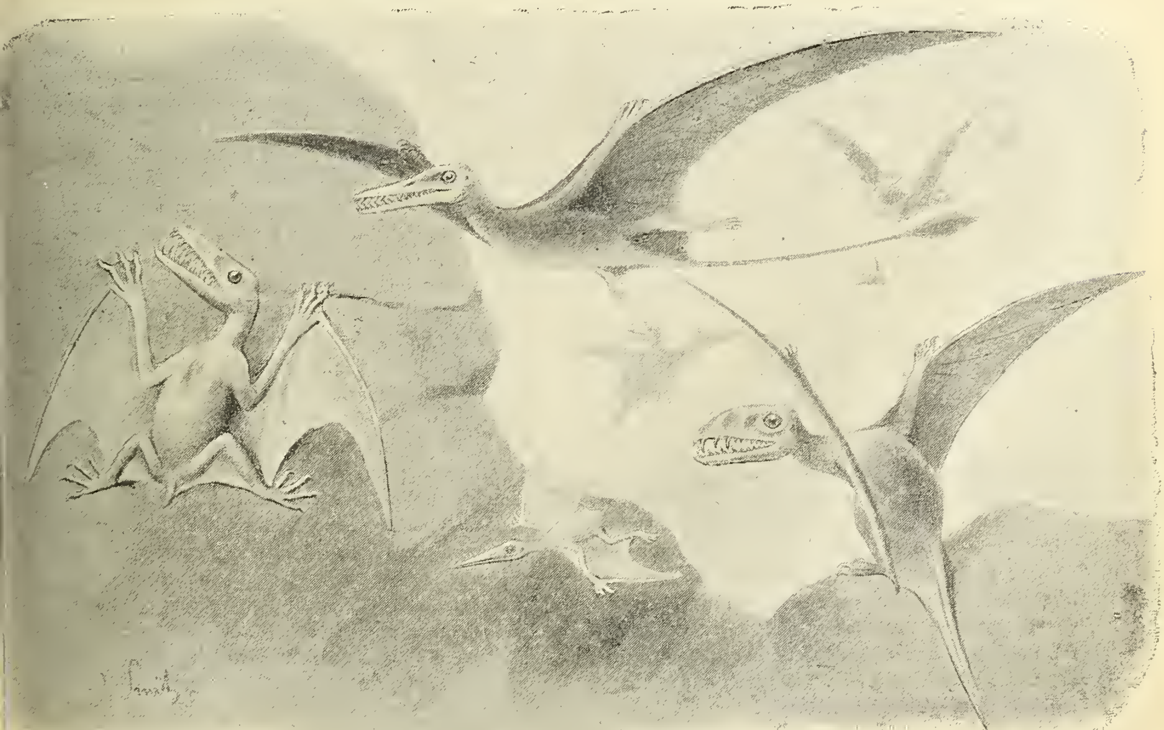

Fig. 66.—Group of small Flying Dragons, or Pterodactyles. (From Ditto.)

"ring" about the lines and the sentiments and conclusions which proved that there was a new "chiel amongst us, takin' notes. "Extinct Monsters," whether from a literary, scientific, or artistic point of view, is the best book and most interesting book on popular geology since Hugh Miller's time. We should have noticed it before but that the publishers kindly offered us the loan of a few artistic blocks, and we could not obtain them before for the reason that the public required a re-issue of the book. The public is evidently growing wiser !

Annals of British Geology, 1891, by J. F. Blake (London: Dulau & Co.). With six plates. This is the second year's issue of one of the most useful books a geologist could place on his shelf. It is brimful of conscientious and careful work. It contains the pith and marrow of the matter of nearly seven hundred books, papers, and pamphlets relating to geology, published during the year 1891, besides illustrations of all the new species of British fossils discovered during that period. Professor Blake's name alone will be a sufficient guarantee for the accuracy and fairness of the notices and summaries.

British Jurassic Brachiopoda, by W. H. Hudleston, Pres. G.S., and Edward Wilson, F.G.S. (London: Dulau & Co.). A most important work, which nobody but enthusiasts would undertake, and yet an absolutely necessary work for palæontologists all over the globe, for the genera and species described are not necessarily British. It is essentially a work of authoritative reference, from which there can be no appeal. Mr. Hudleston, the president of the Geological Society of London, is responsible for the Oolitic portion of the work, and Mr. Edward Wilson (of the Bristol Museum) for the Liassic part. Over a thousand species of fossil Jurassic Gasteropoda are herein classified and catalogued, and their bibliography detailed as well. It is a monument of solid, patient, and valuable scientific learning, and the volume is bound to be appreciated at the high value it deserves.

THE LONG-TAILED AND SHORT-TAILED FIELD MICE.

By K. Hurlstone Jones.

THEY are both very great friends of mine, especially he of the short tail, albeit he is not so good-looking as his relation. The long-tailed is, indeed, one of the most beautiful mammals inhabiting this island. His body and limbs are long and agile ; his tail, too, is very long and tapering, as his name implies, whilst his ears are large and round, and of a very delicate texture. His colour, too, is very beautiful, the bright fawn of his head and back contrasting most tastefully with the spotless white of the thorax and abdomen. The beautiful full, round, liquid black eye is, however, perhaps the most striking feature of this truly pretty creature. Indeed, it is marvellous how the Great Creator has lavished his gifts upon apparently the smallest and meanest of His creatures, as those who take the trouble to investigate them can show.

The short-tail, although he does not approach his second cousin in point of looks, is far from wanting in beauty. His bright chestnut back and head, and his grey thorax and abdomen, although not so striking as regards colour, still might be preferred by some to those of his long-tailed kinsman. His limbs and body are more or less short and bunched up, his tail also is absurdly curtailed for the length of the trunk. His head is large and round, and his nose short and stumpy in the extreme. His eye is small, black, and oval. His ears are very small and round, and lie pressed closely against the sides of the head, in which respect he resembles his big first cousin the water-rat, of whom, indeed, he forms a most perfect miniature, differing widely from him, however, in nature, as I shall presently endeavour to show. Altogether I think one might well say, that the long-tail and short-tail are, respectively, the patrician and plebeian of their race.

Both these little creatures are great enemies to the farmer, and both make a summer and a winter nest, but on these points I shall say nothing, as they have repeatedly been brought under notice by abler people than myself. The food of both consists of grain and fruit of any kind, markedly the fruits of the wild rose, of which they are very fond. The mice, however, eat the seeds of the above fruit, rejecting the rind, which seems to point out a peculiarity either in the way they eat them, or in the mucous membrane of the mouth and pharynx, for the fluffy envelopes of the seeds cause most intense irritation of those parts in the human subject. I fancy the mice must peel off the outside envelope of the seed, for the mucous membrane of the mouth and pharynx does not present, at any rate so far as I am aware, any peculiar structure.

I once saw one of the short-tailed species very actively engaged in a thorn-hedge running up and down and nipping off the sprouting buds of the honeysuckle. For the most part he carried the buds away into the centre of the hedge, doubtless to be eaten there in some old bird's nest (a favourite salon) at his leisure and convenience. From time to time, however, he sat up and nibbled up a sprout on the bush itself. This is the more peculiar, in that the buds of the honeysuckle have, I understand, a very nauseous taste, and I should be interested to learn if anybody has noticed a similar occurrence.

These mice—I say advisedly "mice," for I do not know if the term applies to both, or either—also eat snails, the empty broken shells of which may be seen in considerable quantity in their runs. There is, however, one species of snail which follows these little rodents, feeding upon their excrementa, and preserving its life by the extremely disagreeable taste of its tissues. The runs I allude to above are not the holes of the animals, but are small tunnels made in the long grass of the field or hedgerow in which the animal lives. These runs twist about and ramify in all sorts of odd convolutions, and are often many yards in length, and generally end in the hole of the owner or owners. These mice are exceedingly numerous, and although they are kept in check to a certain extent by hawks, stoats, and other predatory creatures, nevertheless proliferate in an astonishing manner. They are exceedingly destructive, as I have said before, and a gentleman whose plantations of young trees suffered badly from the depredations of these little anmials, hit upon the following plan to rid himself of the scourge. He buried under their runs numbers of carboys, such as are used to convey acids, with their open mouths upwards; these were dug up after an interval of several months, and almost every carboy was more than half full of a mass of decomposing mice. The mice had fallen in and had been unable to escape. This shows how numerous they must be.

There is one peculiarity, however, about the short-tail, and the same applies to a certain extent to the long-tail, which distinguishes it from any other wild creature found in this country. The peculiarity is this, that if you catch a mouse of the above species in a trap, and handle him gently and coolly, he does not make the slightest attempt to bite or to bolt, and in a couple of days is as tame or tamer than a white one. I have it on good authority, that the same holds good for the mongoose of East Equatorial Africa, which is quite tame a day or two after being caught. The long-tail certainly does attempt, and that to the utmost of his ability, to escape, but even then I have never known him bite, unless roughly handled. This statement may sound extraordinary, but it is nevertheless true. The above facts may not apply to the breeding season, probably they do not, but they are true for the winter and spring, within my own experience. Of course if you hurt or frighten the poor little owner of the short tail, he will soon show that he can bite, and that with a hearty good-will.

There is one more fact I should like to indicate, and that is that these animals are most horrible cannibals. Not, indeed, that they kill one another, far from it, but if one mouse dies, in cage with several, the survivors immediately set to work and eat up every scrap of the deceased, beginning at the head and ending with the tail, in the most orthodox manner. This trait in their character is probably of great service to them in their wild state, for they are excessively clean animals, and you can easily imagine how disagreeable a dead body would soon become in a hole with several inmates. So said inmates go to work with the instruments and instinct which nature has given them, to remove the corpse with all the regularity and dispatch of a sanitary inspector. If you want to get a mouse, don't bother about any very complicated trap, but set an ordinary mousetrap, baited with a bit of cheese, in any hedgerow, and you won't be long in getting a specimen. Keep the little creature in a large roomy cage, give him plenty of fruit and vegetable food, no cheese or meat, for though he likes them immensely, they don't agree with his constitution, and above all, as the animal is above suspicion in point of cleanliness, keep the cage and everything about it in the same condition. If you find your trap down from time to time, you may make sure that it is some rascally shrew is the robber, for he can easily push his small flat skull between the bars, and so make his escape, unless, as sometimes happens, the door of the trap drops on his tail and he is made a prisoner. Take care how you handle him, however, for he is not so good-natured as the mice, and his teeth, though small, are very sharp.

If you will forgive the digression, there are one or two little points about the shrew or shrew-mouse, as he is erroneously called, which I should like to call attention to. He is not a mouse at all, nothing so respectable. He is a member of the great family of insectivoræ, and nearly allied to the mole, as a glance at their respective teeth will easily show you. The mice, on the other hand, are rodents; compare the two sets of teeth, if you have not done so, and note the striking dissimilarity. Why, the shrew is more nearly related to the lion and tiger than to the mice!

Fig. 67.—Long-tailed Field-Mouse.

The point of most curiosity and difficulty lies in the solution of the problem of the numbers of shrews which are found dead, notably by the roadside, about the end of July and beginning of August. Someone, I believe the late Rev. J. G. Wood, propounded the theory that these shrews were killed by cats and hawks. He said that the animals, from their cautious and secretive habits, could only be attacked with ease when crossing a roadway, and as the aggressors would not eat their prey, they left them where they killed them. But this theory won't hold water. A friend of mine and his brother managed, just casually looking in a lane a mile long, to pick up eighty-seven dead shrews on the roadside; doubtless, strict searching in the grass would have doubled the number. Now, hawks and cats will not account for such a wholesale slaughter as that; moreover, most of the shrews found thus showed not the slightest signs of violence or rough usage. Obviously, then, there must be some other cause for death. My idea, correct or incorrect, is this, that at that period of the year in which this great mortality takes place, the shrews obtain with their food some bacteria or micro-organisms which produce a condition fatal to the life of the animal. I intend, however, if I have time and opportunity, to make a microscopic research on this subject this summer, and I wish some other readers of SCIENCE-GOSSIP would do the same, to see what decision we arrive at. And now I wish you *au revoir* before I weary you.

SCIENCE-GOSSIP.

OUR old planet is practically as solid as if it were made of cast-steel, and as elastic as an indiarubber ball. The incoming and outgoing tides, as well as the varying barometrical pressures of the atmosphere cause the crust of the earth to rise and fall like the palpitation of a small bird's bosom. This that wonderful little instrument the microphone has demonstrated. Nevertheless it must not be imagined that either geologists or astronomers have got all out of the interior of the earth that is contained within it, even in the shadowy form of scientific speculation.

THERE was a very pretty and courteous little duel recently going on concerning the physical condition of the interior of the earth, more particularly as respects that part lying immediately underneath the outside skin we call the earth's crust. The duellists are the Rev. O. Fisher, one of the best, even of Cambridge mathematicians, and a geologist and physicist of thirty years' standing, and Professor Darwin, eldest son of the reverend naturalist. Mr. Fisher believes in the earth's kitchen-boiler still containing an enormous amount of original heat, and he boldly declares that the amount carried off by conduction through the earth's crust, even in one hundred million of years, is quite inconsiderable, compared to the full amount generated in the interior. Mr. Fisher is evidently not disinclined to believe in what we were rash enough to declare more than a quarter of a century ago, that if the earth's crust is as thin as some geologists make out, and the age of our planet anything approaching what is usually declared, there must exist convection currents in the interior, which prevent the crust from growing thicker by melting off the lower parts as fast as they solidify. Possibly this may have been the cause, as Professor Green pointed out twelve years ago, of the gradual conversion of the lower-seated rocks, such as gneiss, granates, etc., into their pasty igneous condition.

THE Hertfordshire Natural History Society is probably one of the most important of its kind in England, comprising nearly 300 members, among which are the names of many leading naturalists and scientists of the day, Professor Huxley, Sir J. Lubbock, Miss Ormerod, the late Sir Richard Owen, etc., etc. We have before us three numbers of this society's "Transactions" of the past year, and these transactions contain some extremely interesting and learned papers, foremost among which stand "Bats and some other Birds," by G. Rooper, F.Z.S., "Terrestrial British Quadrupeds existing in a Wild State at the Present Day," by T. V. Roberts; "Our Food-Fishes, their Friends and Foes," by F. E. Beddard, F.Z.S.; "Report of the Rainfall in Hertfordshire in 1891," by the President and Editor, together with the society's business, list of members, and other engaging papers.

WE have received the "Annual Reports and Proceedings," of the Liverpool Science Students' Association for the sessions 1890–91 and 91–92, containing several papers, foremost amongst which is Mr. E. D. Fish's, "On the Classification of Insects," in which he adopts Westwood's taxonomy, which divides the Insecta into thirteen orders, several of which — Strepsiptera, Thysanoptera, Aphaniptera, etc.—are now merged into one or other of the existing eight, and well recognised orders. "Fossil Fish from the Old Red Sandstone of Caithness," by J. Herbert Jones, which are all ganoids, or those which had a bony armour. The existing representatives of these nearly "lost creations" now hold their own in the waters of the St. Lawrence River. He also goes on to mention the *Pterygotus*, club-mosses, ferns, and Coniferæ.

AT a recent meeting of the Royal Institution, connected with the Hodgkins Trust, the following resolution from the managers was read: "Having regard to the fact that the work of the Institution is devoted to the attainment of truth, and thereby constitutes in itself an investigation of the relations and co-relations existing between man and his Creator, resolved that the income of the fund be devoted to that work, and that once in seven years a sum not exceeding 100 guineas be paid to some person to be selected by the manager for writing an essay showing how the work of this Institution has, during the preceding period of seven years, furthered the objects of the trust.

ON February 6th the Rev. J. Magens Mello, M.A., read a paper at the Victoria Institution, on Prehistoric

Man, in which he sketched the results of the investigations of all known anthropologists. A discussion ensued, in which Mr. Woodward commented on the value to investigators of Mr. Mello's "impartial and admirable résumé" on the question.

ALL scientists are agreed that we are on the verge of a great discovery as regards the composition and behaviour of matter. The "atomic theory" of grand old Dalton was the preliminary speculation; Prof. Cooke, of Boston, in his "New Chemistry," came next; and Prof. Crookes, one of our most original researchers, followed quickly with newer and more startling opinions. We speak of the seventy odd elements dealt with by chemists in their laboratories, as if they were so many "creations" of distinct kinds of matter, just as naturalists, in the time before Darwin, used to write about the special "creation" of animals and plants. The tendency of modern chemical and physical research is to show there is only one kind of matter, varying according to development and environment, just as animals and plants have done. This has been strikingly shown in some recent experiments with nitrogen. Prof. Dewar's still more remarkable experiments with liquid oxygen have thrown an almost lurid light upon the subject, of how matter varies under varying conditions. In its liquid state oxygen is as highly magnetic as iron and steel!

IT seems probable that we have yet much to learn concerning the behaviour of the universal force, of whose nature we know nothing. A very remarkable paper has just been read before the Paris Academy of Sciences by Mr. Mascart, showing that gravitation is liable to diurnal variations. Mr. Mascart's apparatus for testing this fact was both simple and ingenious. A barometric tube, enclosing a column of mercury 4·5m. in length, balanced by the pressure of hydrogen contained in a lateral vessel, has been kept surrounded by earth for several years, at the Parc Saint-Maur Observatory, only the short upper end emerging from the ground. A study of the daily motions of the column, by means of photographic registration, has recently, apart from the slow and steady changes due to inevitable differences of temperature, shown sudden variations, lasting from fifteen to sixty minutes, which can hardly be explained otherwise than as due to corresponding variations in gravitation. They have been as high as 1·20 mm., or 1-90,000. The differences of sea-level from high to low water would only produce one-fifth of this variation. The phenomena, if due to subterranean displacements, would be specially interesting in volcanic districts.

AT the close of the glacial period some beautiful Arctic animals lived in Great Britain. Their fossil remains are frequently met with, even near London in the brick earths of the Thames Valley. Of course, the Arctic regions now represent their only home. Colonel Fielden, however, who is both a distinguished naturalist and an Arctic traveller, suggests that the musk ox might, with advantage, be introduced into Great Britain. He sees no reason why it should not thrive on the mountains of the Highlands of Scotland. In the winter season the musk ox is covered with a long-stapled fine wool in addition to its coat of hair. This wool is of a light yellow colour, and as fine as silk. Sir John Richardson states that stockings made from this wool were more beautiful than silk ones. Young musk oxen are very easily reared and tamed, and Colonel Fielden thinks there could not be any great difficulty in catching either old or young in Jameson's Land.

ALL our readers are aware how, ten years ago, a great noise was made about the rediscovered discovery, that green fodder for cattle could be stored in prepared pits and otherwise, and that after pressure it would retain all its nourishment, such as albuminoids and sugar, and be available for use as cattle food the following winter. Cattle not only preferred it in winter to any other kind of diet, but throve upon it and got fat, and the milch kine who were partakers of it produced a more abundant supply of rich milk. Thus breeders of stock and keepers of cows found it better, healthier, and cheaper to store away their green crops in early summer in ensilage pits and stacks for winter use, rather than use the dried grass we call hay. But English agriculturists have not discovered everything themselves in this important line of observation, and it has been reserved for an Australian farmer to discover that ensilage may not only be stored away for the following winter, but may be kept in store for five or six years without interference with its pleasant and nutritious properties. This is a most valuable discovery for farmers, especially those in the colonies, inasmuch as the surplus of bounteous seasons can now be stored away for use in non-bounteous times, after the manner of the seven years of plenty and the seven years of famine. Henceforth, therefore, farmers may regard ensilage as a valuable reserve to fall back upon, when, as not infrequently happens, there is an exceptional shortness of fodder.

ALL rodent animals are remarkable amongst mammals for their reproductiveness. Left by themselves, and not kept down by any natural police, they would increase and multiply and overrun the whole terrestrial globe. One of the chief of the natural police to repress them is the common barn-yard owl. But this once very familiar bird happens to be in the black books of the pheasant breeders' gamekeepers. Consequently it is trapped, shot, destroyed in every possible way, until now, even in uninvaded country districts, owls are almost as rare as swifts. The late Edward Newman, one of the most practical naturalists of the present century, states in one of his books that every owl was worth £5 per year to the British nation. It is chiefly a field-mouse and vole feeder, and therefore checks the otherwise harmful results of the procreativeness of those familiar rodents. Some parts of Scotland, during the last two summers, have suffered terribly from the pest of voles, perhaps to the amount of scores of thousands of pounds, and Sir Herbert Maxwell was appointed to form a committee to report to Parliament. This report to Parliament will probably be presented before these notes are printed, and it cannot fail to be of an interesting character. The inference will be that the gamekeepers of game-preserving landlords must not be allowed to rule the zoological balance of the British Islands. Last summer certain parts of Greece, especially Thessaly, were terribly overrun by the same species of rodent, inasmuch as the Greek Government called in distinguished French and German zoologists to advise thereon. Thessaly is chiefly inhabited by Mohammedans, and they have recently sent to Mecca for some holy water to get rid of the voles!

VISITING-CARDS are almost amongst the necessities of the age, insomuch that no well-brought-up or respectable maidservant can be without them. Those who have to move about the world have always found them of service, and in not a few instances a few of them in his waistcoat pocket might have saved many an innocent man from a night in jail. Hitherto they have been made of pasteboard, but now they are being manufactured of iron. "Invention" states that forty of these iron visiting cards, piled one upon the other, form a layer of only the one-tenth part of an inch in thickness. The plates are black, and the names are printed on them in silver, so that they show up very clearly and artistically.

LAND-SURVEYING will henceforth be carried on more effectively and picturesquely than hitherto, by the aid of photography. The successful application of the latter has been demonstrated without doubt, both in Europe and America. Since the year 1888 a zone of twenty miles on each side of the Canadian Pacific Railway has been surveyed with the aid of photography. Four men were employed upon the job, and they have got through between 900 and 1000 miles a year, thanks to photography, in spite of the great disadvantages of the climate.

DR. VINES, the Professor of Botany in the University of Oxford, has for some time past had in preparation a "Student's Text-book of Botany," which will be more comprehensive than his edition of Prantl's well-known "Elementary Text-book." Although the work will not compete either in size or in price with the larger handbooks, it is hoped that it will be found to contain, in proportion to its size, a greater amount of accurate information than any other general work on the subject. It is to be fully illustrated, and is expected to be ready early in the autumn of this year. It will be published by Messrs. Swan Sonnenschein & Co., in London, and by Messrs. Macmillan & Co., in New York.

WE have much pleasure in noticing the Report of the Felstead School Natural History Society Club for the past two years. We are always glad to welcome a new society of nature's observers, or even a single observer of nature; but whilst scanning this report, we are sorry to see that young lepidopterists are permitted to excursionise before learning that ten bad specimens are not worth one good one, and we would advise the ramblers to go at it more gently, and not to cripple the specimens.

MILLIONS of shooting stars pass through the earth's atmosphere every day. At night, when it is dark enough, we can see the long trails of light left behind by the larger ones, but in the daytime such appearances are rare indeed, and are due to exceptionable instances. By day and night, however, meteorites are passing to and from our earth's atmosphere, like bees in a hive. Each is a true planet, although it may only weigh two ounces. These shooting stars travel at a rate of between thirty and forty miles a second. As long as they circulate in what we call space, there is little or no friction, and therefore no waste. But as soon as they pass into the denser medium of what we call the earth's atmosphere, the friction of their rapid movement generates heat, of such a high temperature that the long trails of brilliant light they leave behind in the sky are a manifestation of it.

SHOOTING stars, or meteorites, have been roughly, but naturally, separated into two great classes—stony and metallic, according as they contain 50 per cent. more of one or the other. The largest of these celestial bodies which have been overcome by the gravitation of the earth, have reached the surface of the latter with an immense impact, sufficient to bury themselves sometimes many feet into the soil. Some of these heavenly descended visitors are historic. St. Paul refers to one partially worshipped at Ephesus in the Acts of the Apostles. The black or Caaba stone of Mecca, which attracts hundreds of thousands of Mohammedans every year, only for the sake of kissing it, is another. The semi-ancient Aztecs, who evolved the highest form of religion in the New World before its discovery by Europeans, paid worship to several meteoric stones of large size, which had descended from the sky. Recently, an important meteorite fell in the Canyon Diablo, in Western America, and portions of it have been carefully studied by the most distinguished of French mineralogists. One remarkable thing in the metallic meteorites above referred to, is the combination of iron and nickel, in a way that we know not of on our earth. Thus, the Canyon Diablo meteorite contained iron to the extent of 91 per cent., and nickel to as much as 7 per cent. It also included small diamonds, both black and transparent, the largest of which measured seven millimetres by three. The latter had a yellow tint and a rough surface, but was quite transparent to light.

THE double number of the "Entomologists' Record" for last month, contains papers by the editor, J. W. Tutt, F.E.S., T. A. Chapman, of Hereford, A. J. Hodges, and others. The last-named gentleman's suggestion of labelling is, in our mind, unnecessary, as one always associates sugar with matters one takes as sugar, light with those as light, and so on. Mr. Chapman's paper, on "Stauropus Fagi," is certainly excellent, and brings out that gentleman's powers of observation.

THE "Entomologist" for March contains very good papers, "On the Lepidoptera of Ireland," by Vismes Kane, M.A.; "The West Indian Species of Ceroplastes," by T. D. A. Cockerell; while the Rev. O. P. Cambridge's "Reminiscences of the late Professor Westwood" will interest every entomologist who knew that great entomologist. Mr. Baukes has made a great discovery. We have never before seen a catalogue of British lepidoptera which included *Catocala electa*.

MORE than ten years ago the scientific world was startled on hearing that real diamonds, real rubies, and other precious stones could be artificially produced. The discovery was made in one of the Glasgow ironworks. We have not heard anything more about it since, except the fact that the artificial production of these stones is possible. They were too small to be of any market value. Nature takes millions of years to produce her stones, and the Koh-i-Noor and the Pitt diamond may be as old as anthracite coal, to which they are chemically so nearly related. The history of diamonds and other precious stones is intimately associated with the history of emperors, kings, queens, and courts. They never travelled far beyond those boundaries, until Europe, America, and Australia evolved a wealthy middle-class, and rich merchants were importuned by their squaws to adorn them therewith. No kind of precious stone, however, has interested wealthy humanity more than the diamond. In one of his Cambridge historical lectures, Canon Charles Kingsley gives an historical genealogy of some of the best-known of precious stones. Since they have been discovered so abundantly at the Cape we have learned something of their possible origin. Our readers have doubtless frequently heard of the phrase "blue earth," which, in the neighbourhood of Kimberley, is diamondiferous. Many geologists believe that this blue earth is the decomposed lava-like material filling the throats of long extinct volcanoes. This blue earth has recently been subjected to careful microscopic and chemical examination. It is crowded with microscopical diamonds, as well as the raw materials, such as graphite and carbonado, from which they have no doubt been formed. Even the graphite (the mineral that is more familiar to us under the name of blacklead) is found in this blue earth, crystallised in six-sided prisms. After careful chemical treatment of the blue earth with sulphuric hydro-fluoric acid and chlorate of potassium, the residuum was crowded with microscopic diamonds, black, yellow, and white.

WE have heard a good deal from time to time concerning the pernicious habit of opium-smoking. There are always two sides to a question, but he is a bold man who takes up the position of *advocatus diaboli* on this. Everybody has been so hose-piped with "facts" and statistics concerning the use of opium, that it comes with an unexpected surprise upon us to hear of a defender pleading for its use. This is what Dr. Nightingale does, however, in the last number of the "Asiatic Quarterly Review," and his remarks are based upon personal experience, obtained among the Chinese themselves. He declares that the use of opium is not only not an evil, but that in the majority of cases it is actually beneficial in warding off fevers, or lowering their attacks. It enables Chinamen to perform heavy coolie work at a temperature of 150°, which no other race can perform. It does not make the Chinaman quarrelsome, as alcohol does his Western brother. It also enables him to stand a great amount of pain. Dr. Nightingale is firmly of opinion that the more the opium question is gone into the less harm will be found to result from the use of this drug.

THE March number of the "Annals and Magazine of Natural History" contains the following original papers by well-known naturalists: "The Affinities and Origin of the Tardigrada," by Prof. J. von Kennel; a palæontological treatise "On Some Newly-described Jurassic and Cretaceous Lizards and Rhynchocephalians," by G. A. Boulgener; "Descriptions of four new species of Butterflies from N.W. China," by H. Grove Smith, together with the "Embryology of the Mites," "A New Porcupine from East Africa," and "The Mechanical Genesis of the Scales of Fishes," by John A. Ryder.

MESSRS. L. REEVE & CO. have in preparation a new work on the British Aculeate Hymenoptera, from the pen of Mr. Edward Saunders, F.L.S., uniform with the same author's work on the Hemiptera Heteroptera just completed.

THE February number of "The Botanical Gazette" is above the average run—although always full of good matter. Among the articles may be enumerated a six-page paper on "A Comparative Study of the Roots of Ranunculacæ" (illustrated), by Fred Maxwell; "Flowers and Insects," by C. Robertson; and the "Influence of Anæsthetics on Plant Transportation," by Albert Schneider. Towards the end Mr. F. Cook is also very interesting in his note "Is Polyporus Carnivorous?"

"NATURE NOTES" for this month (March) contains a considerable number of sonnets, to one of which, by Robert Bridges, our attention is especially and correctly drawn by the editor. Several of the articles are exceedingly enjoyable and instructive, among which stands forth the "Last of the Kingfishers;" and the "Daily News" article on "White of Selborne" will interest many.

THE "Bibliography" running through the "Naturalist" will be very useful for reference purposes, when bound at the end of the year. J. Spencer's article on the "Glacial Boulders in Calderdale" indicates keen observation; and the various other papers will be very welcome to local botanists and ornithologists.

"THE JOURNAL OF BOTANY."—The editor of this excellent monthly is anxious to increase the number of subscribers, in order that the number of plates may be increased in proportion. Readers wishing to become monthly recipients of this magazine should send their yearly subscription (12*s*.) to the editor, 18, West Square, Southwark.

THE question of the origin of the human race is once more to the front. We love to speculate upon our noble selves—our whence and our whither. Lord Beaconsfield preferred the "angel" theory, and dear old "Punch" cartooned him, more than twenty years ago, attired in angel costume (that is, a pair of enormous wings without muscles to work them), smiling at his own presentment in the pier-glass of his dressing-room. The origin of man is now being discussed as if it were as important as his destiny. Professor Virchow, the distinguished German anthropologist and stiffest opponent of Professor Hoeckel (the "Darwin" of Germany) strongly leans to the "fallen angel" origin of mankind. He has made a special study of the comparative anatomy of human crania. Possibly specimens of those of every race now existing on the face of the earth except one have passed through his hands in the course of his life. Recently the exceptional skulls have been secured—those of some native races in the peninsula of Malacca. As is usual with remnants of ancient races, these people are mountain-dwellers. A Russian traveller has recently penetrated into their jealously guarded mountain villages, and writes to Professor Virchow concerning the appearance and physiognomy of this ancient people. They are of very small stature, very curly-haired, and their skulls are remarkably like those of negroes. They present no anatomical signs of simian or ape origin.

No other form of crystallised matter has such a wonderful fascination as the diamond. The baroness as well as the burglar is spell-bound by it. It is the pearl of great price, unless it is too yellow—"Cape-ish." Then it can only be worn at night, but where there is no electric lighting. Some three or four weeks ago we had occasion to draw attention to the new and marvellous electric furnace invented by a French electrical engineer, M. Moissan. The latest news of its doings are that real diamonds have been produced thereby from the fusion of carbon with silver, or cast-iron. This sounds very like the conditions in which we find diamonds in shooting stars or meteorites. The temperature required to produce real but artificial diamonds by M. Moissan's process runs up to three thousand degrees! Fifty horse-power is required to generate the electrical energy of conversion of the carbon from the amorphic (or blacklead-and-soot stage) to the crystallised or or diamond condition. How many duchesses, countesses, actresses, etc., etc., are aware of the enormous "horse-power" represented by their diamonds? Of course this moral and scientific remark refers to the "genuine article," not paste.

NEWS, however brief, reaches us from Vienna of the outbreak of a desolating epidemic of quite a new character, which is now raging in the Russian Trans-Caspian provinces. The world has hardly recovered from the "Russian influenza." Are epidemics the only gifts Russia can give to the world? Some nations degenerate into pest-houses, and breed epidemics to be free-traded.

Is it not becoming important that architects should know something of geology—especially the architects who persist in building rows of heavy streets as nearly as possible to the verge of cliffs in popular seaside resorts? At Sandgate and other adjoining localities along the sea-coast the cliffs are formed of upper greensand, a loose, porous, and easily-saturated bed resting upon the gault-clay, the latter being as greasy as soap. Along the Suffolk coast the condition of the cliffs is physically similar, although of a later geological date. In the latter district the sands and shell beds of the red crag rest upon an equally greasy surface of underlying London clay. Along the southern and eastern coasts, along the junction of the sands and clays there is a constant oozing out of water, even under natural and uninfluenced physical conditions. Plant half a million tons of houses on the top of such sand-cliffs, if anywhere in the world, and can it be surprising if their pressure upon the yielding superstratum will induce its sliding down over the surface of the greasy and unyielding clay bed beneath? Our seaside resorts are becoming more built upon every year, and unless architects learn a little geology, seaside landslips will be as common as measles.

ZOOLOGY.

Helix nemoralis with an Umbilicus.—During a visit to Weymouth I found about thirty specimens, some dead, of this shell with a distinct umbilicus, large and well formed. This var. only occurred in one place, and was found within a short distance of each other.—*J. Moore, Birmingham.*

Variety of Vitrina pellucida. — I have a specimen of *V. pellucida* of a bluish white colour, quite opaque and having round the mouth and suture of the shell a pink-coloured band. Is this variety common and is it named?—*J. Moore, Birmingham.*

A New Preservative Fluid for Slugs.—After repeated trials to obtain a good preservative fluid for slugs, I have found the following to act so admirably in preserving the colour, etc., that I think it would be well to place it on record, so that others may benefit by its use. Dissolve 10 grains of alum, 2½ grains of common salt, 1½ grains of potassium nitrate, 2 grains of arsenious acid, and 2 grains of mercuric chloride in 5 ounces of distilled water, and filter. Readers will see that this is an altered Wickersheimer's "first" formula ("Amer. Mon. Micr. Journ.," vol. ii. pp. 4–5). After well cleansing the slugs from mucus, I place them in tubes containing the above solution, and well seal with a mixture of five parts of *old* guttapercha and four of asphalt applied hot, and obtain the best results.—*J. W. Williams.*

The Water-rail (Rallus aquaticus).—Having read Mr. Godfrey's article upon this bird, which doubtless appears to be much rarer than it really is, I herewith send a few observations on it which I noted a few years ago. Two of these birds took up their abode in the vicinity of a very small pond in the village of Bratton St. Maur, Somerset. They were not very shy in the early morning, which appeared to be their principal feeding-time, but were not often visible after nine o'clock. Their movements, too, when in search of food greatly resembled those of the moor-hen, and, as far as I could judge, they fed principally on aquatic insects, and *Pisidium amnicum*, this mollusc being very plentiful in the pond. I hoped to have been able, in due course of time, to watch the nesting operations, but unfortunately a cat killed one of them; I then shot the other and had it preserved. What struck me greatly was the fact that the pond was not one hundred yards away from our house, was destitute of reeds, and for shelter had only a small hedge on one side, a remarkable locality to be chosen as a haunt by so timid a bird. I noticed that when on the wing its flight was low, short and swift.—*E. W. Swanton, Wychling Rectory.*

BOTANY.

Cordiceps militaris.—It may be of interest to some of your readers to know that a rare specimen of *Cordiceps militaris* from Glamorganshire, South Wales, was forwarded to me last autumn by a little girl, Rosemay Tarleton, daughter of John Tarleton, Esq., King's Co., Ireland, aged about eight, whose name is deserving of mention as a keen observer of nature. It is the variety Spherocephala (Schmp.). It is noticed in Cooke's recent book on entomogenous fungi, as one which has been only recorded from Saxony. He says: "We have seen nothing corresponding to it in Britain. In this variety the stem is long and flexuous and thinner than usual. The capitulum is nearly globose. It grows on the pupæ of insects. The sporidia are long and thread-like, in long filiform axi." As the fungus is of a deep red colour, a section showing the projecting perithecia with their axi makes a very striking object with a sub-stage parabolic condenser. The specimen was identified for me by Greenwood Pim, Esq., of Dublin.—*Charles D. Russell.*

Dicotyledons have netted vein leaves, and have their seeds in two pieces. Monocotyledons have parallel vein leaves, and have their seeds in one piece. Dicotyledons have two lobes, and monocotyledons have one lobe. The arrangements of leaves are caused by what they have to do. Phyllon is the name given for the arrangements of leaves, and means a leaf. Some leaves are arranged cross-ways. The shapes of leaves vary in size and shape, and their shape is caused by what they have to do. Some leaves we should know by their shape, for instance, the ivy-leaf, and also the holly-leaf. Some shapes of leaves are like a saw.

Orobanche elatior, and O. minor. — In answer to Mr. L. Creaghe-Haward, I have seen *Orobanche minor* on *Trifolium pratense*, *Carduus crispus*, *Crepis virens*, *Nepeta glechoma*, *Leontodon autumnalis*, *Hedera helix* (not *O. hederæ!*), *Eryngium maritimum*, *Picris hieracoides* (not *O. picridis*) and *Daucus carota* (not *O. amethystea*). Dr. Bromfield records it on *Plantago coronopus;* Professor Henslow on *Carduus nutans;* Brebisson ("Flora Normandie") on *Hypochæris radicata*, *Medicago maculata*, *Vicia angustifolia*, *Onobrychis sativa*. *O. elatior* is recorded as found on *Centaurea scabiosa*, *Scabiosa arvensis*, and *Carduus lanceolatus;* I have never seen it but on the first-named. I have found this one of the most difficult to get up with the host attached *in situ*. *O. caryophyllacea* I have gathered on *Galium mollugo* abundantly, on *Rubus* sparingly; and it is recorded as found on *Galium verum*, and *Lotus corniculatus*. *O. amethystea* I have found on *Daucus carota*, *Ononis arvensis;* and it is recorded as on

Eryngium maritimum, and *Plantago cornopus*. I should be obliged to Mr. L. Creaghe-Haward for fresh specimens of any *Orobanche* on any host *in situ* other than those I have named as gathered by myself, and would gladly send him *O. picridis*, *O. caryophyllacea*, etc., in return. Specimens (which must be in a freshly-gathered state for certain determination) from any part of Great Britain or Ireland will be very acceptable to the writer. I may add that *O. cruciata* (Bert.) is a species new to our Flora, found many years ago in Argyle, Scotland; but which was only determined as the above last autumn. — *Arthur Bennett, Croydon.*

GEOLOGY.

Pebbles of Native Sulphur at Beddgelert, N. Wales.—In looking over an old collection of minerals, I find some rolled pieces of native sulphur, apparently derived from the drift labelled with the above locality. Can the correctness of this be checked by other observations, or is it a mistake? It has some bearing on geological theory.

Jet at Weston-super-Mare.—I have also some pieces of lignite hardened into jet, said to be from this locality. I am inclined to doubt the accuracy of the label. It looks so much like Whitby jet. If correct, perhaps some mineralogist will kindly confirm. When shall we have a book devoted in an exhaustive fashion to British minerals?—*T. S.*

London Geological Field Class, conducted by Professor H. G. Seeley, F.R.S.—The following localities have been selected for the Saturday-afternoon field excursions during the ensuing summer session:—Physical Geography—April 29th, Edenbridge and Westerham, escarpment of lower greensand; May 6th, Chesham and Amersham, Valley of the Cheve; May 13th, Epsom and Burford Bridge, surface of the Chalk Downs; May 22nd, Whit-Monday, Midhurst and Petworth, South Downs and the Weald. Tertiary Geology—May 27th, Amersham, gravels in Chalk Valley; June 3rd, Bracknell and Warfield, lower London clay; June 10th, Reading, Reading beds; June 17th, Upnor, Thanet sands and Woolwich beds. Secondary Rocks—June 24th, Betchworth to Burford Bridge, chalk and lower greensand; July 1st, Dunton Green and Sevenoaks, chalk, gault, and lower greensand; July 8th, Three Bridges for Worth, Wealden beds; July 15th, Haywards Heath for Cuckfield, Wealden beds. The general secretary is Mr. R. H. Bentley, 31 Adolphus Road, Brownswood Park, South Hornsey, N., from whom all information may be obtained as to membership.

NOTES AND QUERIES.

Sillgreen (p. 46).—In this part of Berkshire the house-leek (*S. tectorum*) is commonly called sillgreen by the country folks. The juice of the leaves mixed with cream is accounted a good remedy for burns and scalds.—*W. H. Warner, Fyfield, Abingdon.*

The Instinct of Locality in Animals.—The "Spectator" says, "A cat carried a hundred miles in a basket, a dog taken, perhaps, five hundred miles by rail, in a few days may have found their way back to the starting-point. So we have often been told, and no doubt the thing has happened. We have been astonished at the wonderful intelligence displayed. Magic, I should call it. Last week I heard of a captain who sailed from Aberdeen to Arbroath. He left behind him a dog, which, according to the story, had never been in Arbroath, but when he arrived there, the dog was waiting on the quay. I was expected to believe that the dog had known his master's destination, and been able to inquire the way overland to Arbroath. Truly marvellous! But really, it is time to inquire more carefully as to what these stories do mean; we must cease to ascribe our intelligence to animals, and learn that it is we that often possess their instinct. A cat on a farm will wander many miles in search of prey, and will therefore be well acquainted with the country for many miles round. It is taken fifty miles away. Again it wanders, and comes across a bit of country it knew before. What more natural than that it should go to its old home? Carrier-pigeons are taught 'homing' by taking them gradually longer flights from home, so that they may learn the look of the country. We cannot always discover that a dog actually was acquainted with the route by which it wanders home; but it is quite absurd to imagine, as most people at once do, that it was a perfect stranger to the lay of the land. To find our way a second time over ground we have once trod is scarcely intelligence; we can only call it instinct, though the word does not in the least explain the process. Two years ago I first visited Douglas, in the Isle of Man. I reached the station at 11 p.m.; I was guided to a house a mile through the town. I scarcely paid any attention to the route; yet next morning I found my way by the same route to the station, walking with my head bent, deeply thinking all the time about other things than the way. I have the instinct of locality. Most people going into a dark room that they know are by muscular sense guided exactly to the very spot they wish: so people who have the instinct of locality may wander over a moor, exactly to the place they wish to reach, without thinking of where they go. There may be no mental exercise connected with this. I have known a lady of great intelligence who would lose her way within half-a-mile of the house she had lived in forty years. This feeling about place belongs to that part of us that we have in common with the lower creatures. We need not postulate that the animals ever show signs of possessing our intelligence; they possess in common with us, what is not intelligence, but instinct."—*A. J. Mackintosh.*

Song of the Wagtail.—Both the pied and the grey wagtail are among the songsters whose vocal powers often pass unnoticed: the same remark, I think, applies to the rich bell-like melody of the stonechat, and the inward warble of the spotted flycatcher. In my experience all these birds sing for a very short season in spring, resuming their notes (with, perhaps, the exception of the stonechat) for a few days in autumn. The pied wagtail's song is not always "subdued;" at times it is so loud and shrill as to recall rather the canary than the robin-redbreast.—*C. B. M.*

THE SOLAR YEAR.—Your correspondent T. R. Jones has, perhaps, been misled by some inaccurate astronomical treatise, or perhaps by his own too hasty reading. The year of 365 days 6 hours 9 min. 9·6 sec. is called the sidereal year, and denotes the period in which the sun completes his apparent course through the zodiac, measuring his position with respect to the stars. It does not correspond to the solar year, or period elapsing between two vernal equinoxes: because owing to the sun's own motion through space, the position of the vernal equinoctial point is continually changing. The length of the true solar year is, I believe, 365 days 5 hours 48 min. 49·7 sec. Leap year, therefore, is so far from failing to cover the whole deficiency in the length of the calendar year, that it covers too much, and a day will be omitted, not inserted, in the year 1900. The omission of the 29th of February in a leap year is made three times in every four centuries. The recognition of this necessity was the celebrated Gregorian Reform of the Calendar, accepted by England in 1752, the non-adoption of which by the Greek Church accounts for the fact that Russia and Greece are now twelve days behind the rest of Europe.—*C. B. Moffat.*

BRITISH ORTHOPTERA.—As I contemplate writing a popular handbook on the above, as a companion volume to my "Illustrated Handbook of British Dragonflies," I shall be very glad to communicate with all who are interested in these insects. Local lists and specimens for figuring would be very acceptable.—*W. Harcourt Bath, Ladywood, Birmingham.*

BRITISH DRAGONFLIES.—Will readers who are interested in the above kindly supply me with local lists of same, as I am desirous of elucidating their distribution in this country?—*W. Harcourt Bath, Ladywood, Birmingham.*

SEA-EGGS.—I have read with much interest Mr. P. L. Simmond's article on "eggs," in your issue of SCIENCE-GOSSIP; but I was disappointed to find that he made no mention of a kind which I find in the sea-pools, and which has long puzzled me. They are pale green jelly, slightly oval, and of the size of a sparrow's egg; in the centre is a dark green spot. I find them always in a pool lined completely with the common sea-grass, *Enteromorpha compressa*, and close to low-water mark. The eggs are separate, each anchored firmly to a blade of the grass. I do not know when they first appear, as I only go to the sea-side in August, but they have always gone by the middle of September. Hitherto my attempts to hatch them have been unsuccessful. I should be very much obliged if any of your correspondents could identify them for me.—*F. Pesel,* 14 *Church Hill, Edinburgh.*

MOTHS AND WATER.—In the March number of SCIENCE-GOSSIP Mr. Morley asks why moths (especially the winter and early spring moths) show such a marked tendency to fly into pools of water, and suggests that they may be attracted by the reflection of the moon. I doubt this explanation. So far as I have observed moths usually drown themselves on calm evenings, in the early dusk, while there is still a good deal of daylight remaining, and they seem to avoid bright moonlight. About fifteen years ago, on a calm evening, I was walking along the Royal Canal (Dublin), and I noticed that there were large numbers of *H. velleda* drowning in the water, and that other individuals were skimming the surface. I watched these latter, and I saw how they came to drown themselves; they flew over the surface, from time to time dashing at it, and generally rising again, until ultimately they made too forcible a dash, wetted their wings, and could no longer rise again. Their flight was exactly similar to the flight of moths close to the ceiling of the room, when they have been attracted by light. Careful watching showed me that the probable explanation is in both cases similar; in one case the moths chase their reflections in the water, in the other case their shadows on the ceiling. An interesting point in natural selection here presents itself. In the case of moths whose habitat was the banks of lakes, etc., such a tendency would lead to a considerable loss of life, and so be detrimental to the species. Accordingly, we should expect that the individuals possessing this tendency would be weeded out, until ultimately it would be entirely eliminated. We should, then, expect that the species which habitually live near water would show little or no tendency to drown themselves. How this may be, my own observations are insufficient to decide. I cannot remember having ever noticed specimens of any waterside species drowned in any number. Possibly some of your entomological readers may have made observations bearing on the subject.—*J. R. Holt.*

THE CHICAGO TELESCOPE.—It is commonly supposed that we cannot get any further information concerning the stars, because we cannot cast any bigger glass lenses. But if we cannot obtain a larger image in this way, cannot we obtain a better-defined one, and cast it on a transparent screen or photograph it? This done, it might be examined in detail, I suppose, with a lens?—*A. H. Swinton.*

"SILLGREEN."—I see by last month's SCIENCE-GOSSIP that one of your correspondents complains that he cannot find the word Sillgreen in the "Encyclopædic Dictionary." The form Sillgreen is a very rare one, if indeed it occurs in literature at all. Silgreen your correspondent will find, with a cross reference to Sengreen. He is of course quite correct in supposing the plant referred to to be *Sempervivum tectorum*, the common house-leek. If you have not already answered him, may I ask you to be good enough to incorporate the facts given above in your reply.—*The Editor.*

AUSTRALIAN TOBACCO.—Surely there is some mistake in note on "Australian tobacco," p. 66 of SCIENCE-GOSSIP for March? Tobacco appears as a regular product of Queensland, in "Chambers's Encyclopedia," W. & A. K. Johnston's "Atlas" etc., and was recently alluded to in the daily press as not very successful further south.—*M. E. Pope.*

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

EXCHANGES.

Mrs. G. J. Waterhouse, Waverley, Sydney, N.S. Wales, offers to exchange Australian and Polynesian shells, for British and foreign shells.

Offered, species and varieties of British land and freshwater shells in exchange for local species of our coleoptera.—L. W. Swanton, Wychling Rectory, Sittingbourne.

Will sell or exchange herbarium of micro. fungi, containing nearly all the British uredines, puccinias, and allied forms.—Hilderic Friend, Idle, Bradford.

For sale, a few copies of pamphlets on British worms, 2*s.* Tubes of British earthworms, as catalogued in Science-Gossip, February 1893.—Hilderic Friend, Idle, Bradford.

Conchological and botanical specimens (British and foreign) in exchange for foreign land shells.—T. Rogers, 27 Oldham Road, Manchester.

A large quantity of marine shells (named) in exchange for good fossils, minerals, or bronze implements.—P. J. Roberts, 11 Back Ash Street, Bacup.

Helix lactea, *aspersa*, *cespitum*, *pisana*, *Bulimus decollatus*, *Zonites candidissimus* from Algeria; also land shells from Switzerland and Riviera, for exchange. Wanted, European land and freshwater shells.—J. G. Hargrave, The Grange, Chorlton-cum-Hardy, near Manchester.

Wanted, good birds' eggs, in exchange for 1892 volume of "Knowledge," unbound, and a large number of duplicate British marine shells, either or both.—A. E. Brothers, 15 Norfolk Road, Islington, N.

Offered, good value in micro. slides, for Cassell's (Brehm's) "Book of Birds," or "Illustrated Natural History," by J. G. Wood.—W. Sim, Gourdas Fyvie, Aberdeenshire.

Leda caudata, *Mactra glauca*, *Lyonsia norvegica*, *Aplysia depilans*, *Venus chione*, *Isocardia cor*, *Avicula hirundo*, and other rare shells, and good slides of diatoms and forams, wanted. Can offer *Scalaria clathratula*, *Eulima bilineata*, *E. distorta*, *E. polita*, *Odostomia excavata*, *O. nivosa*, *O. spiralis*, *Barleeia rubra*, *Rissoa cingillus*, *Lasea rubra* var. *pallida*, *Cyclostrema serpuloides*, *Cerithiopsis tubercularis*, and other good shells.—T. E. Sclater, Natural History Stores, Teignmouth.

Large collection of fossils, representing nearly all British strata. Offers wanted in shells not in collection, old collections of stamps, or old coins and tokens.—R. Cairns, Queen Street, Hurst, Ashton-under-Lyne.

Duplicate side-blown eggs of sooty tern, fulmar, cowbird, rook, gannet, shag, bullfinch, common and Arctic terns, Virginian, Collin, and Canada goose. Wanted, side-blown eggs, with data, of many sorts.—F. W. Paple, 62 Waterloo Street, Bolton.

Wanted, to exchange British insects (all orders), shells, curious seeds, nuts, galls, etc., for same from any other country.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

Wanted, several large live specimens of the freshwater mussel (*Anodon*); also a quantity of frog spawn, in exchange for well-mounted micro. slides.—P., 8 Whitehall Park, Hornsey Rise, N.

"Nature," vols. 33-45, unbound; "Knowledge," vols. 1-8, bound; Science-Gossip, 1875-85 bound, 1886-91 unbound; Cox's "Coleoptera;" Stephens' "Brit. Beetles," etc. List sent.—W. R., 106 Trinity Road, Birmingham.

"Playtime Naturalist," and "Voyage Round the World" (Kingston), quite new and clean, cost 5*s.* each. What offers? Also other books. Must clear out before May.—Richard B. Corbishley, Breck Road, Poulton-le-Fylde, Lancs.

What offers for all or any Entozoa (Cobbold), Nematoids (Bastran), "Strange Dwellings and Common Objects Seashore" (Wood), "Sketches British Insects" (Houghton), "Animal Intelligence" (Romanes)?—C. W. Maw, 9 Farcliffe Place, Bradford, Yorks.

Wanted, to exchange new book-pattern store-boxes and setting-boards, larger sizes, for pupæ of *Smerinthus ocellatus*, *S. populi*, etc., pupæ of *A. cynthia*, *cecropia* and others (from America preferred), or *Saturnia pyri* (European). Also during the season, British pupæ and imagines for any species from America.—R. Laddiman, 25 Lower Hellesdon Road, Norwich, England.

Wanted, vol. i. of Kuchenmeister's "Manual of Parasites," published by the Sydenham Society, 1856; also cabinet for micro. objects, with trays for 500 or 1000.—F. R. Brokenshire, 24 Oxford Terrace, Exeter.

Wanted, *Philine sinuata*, Stimps., on loan, or in exchange for rare British shells.—S. W. Chaster, 42 Talbot Street, Southport.

Wanted, a few living plants of *Hymenophyllum Tunbridgense* and *Platycerium alcicorne*. Will give micro. slides in exchange.—T. B., Conservative Club, Hinckley.

What offers for living specimens, male and female, of large warty newt (*M. cristata*), small newt (*M. vulgaris*), large water-beetle (*D. marginalis*), frog spawn or tadpoles, toad spawn, water boatmen, water scorpion, *L. peregra*, *L. stagnalis*, *P. corneus*, *S. lacustræ*, and other pond life? Accepted offers only replied to.—P. Oakeshott, 62 Greenwich Road, S.E.

Washed shale from carboniferous limestone near Glasgow. Wanted, shales from other localities, or works on conchology.—Wm. McInnes, 20 Dixon Avenue, Govanhill, Glasgow.

Parties having unbound volumes of Science-Gossip prior to 1881, which they are willing to exchange for first-class slides, are requested to communicate with George Otis Mitchell, 1034 Pine Street, San Francisco, Cal., U.S.A., stating the years and condition.

Wanted, store-boxes, setting-boards, and other entomological apparatus, in exchange for rare birds' eggs, fossil charts, or books.—Jas. Ellison, Steeton, Yorkshire.

About 650 species of foreign marine shells, many rare, offered in exchange for land and freshwater.—Miss Linter, Arragon Close, Twickenham.

Offered, "The Zoologist," "Entomologist," Science-Gossip for 1890-91, "The Idler," Nos. 1-7, "The Theatre," January to May 1892, A. E. Brehm's "Thierleben," in German, vol. i., 1876, all unbound. Wanted, Badminton series, or offers.—O. Weiss, Harborne Road, Birmingham.

Wanted, good modern works on marine algæ and zoophytes, in exchange for micro. slides, other books, etc.—John T. Neeve, 68 High Street, Deal.

Wanted, a few British diptera, in exchange for British land and freshwater shells.—J. Radcliffe, 111 Oxford Street, Ashton-under-Lyne.

Offered, British grasses and mosses, for named foreign grasses, or for ¼-inch microscope objectives of good quality.—S. Smith, 50 Stanley Street, Cheetham, Manchester.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Poets and Nature," by Phil Robinson (London: Chatto & Windus).—"Medical Annual," 1893 (Bristol: Wright).—"Feuille des Jeunes Naturalistes."—"The Microscope" (The Microscopical Publishing Company).—"The American Monthly Microscopical Journal" (Washington: Chas. W. Smiley).—"Annual Report of the Wellington College Natural Science Society" (Wellington College).—"Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—"The Midland Naturalist" (London: Simpkin, Marshall & Co.).—"Insect Life" (Washington: Government Printing Office).—"Naturalist's Journal" (London: W. Longley).—"How to Improve the Physique," by "Medicus" (London: Elliot Stock).—"Le Diatomiste" (London: W. P. Collins.—"Le Micrographe Préparateur" (Paris: J. Tempère), etc., etc.

Communications received up to the 10th ult. from: F. G. S.—E. W. S.—W. G. C.—S. S.—J. K. H.—E. R. S.—T. B.—G. W. C.—J. H.—L. K.—P. & O.—J. E.—G. O. M.—J. K.—J. & S.—J. T. N.—O. W.—M. L.—D. H. P.—W. McI.—R. & C.—A. B.—T. W.—C. M. M.—Mrs. G. J. W.—A. S. W.—F. W. L.—W. H. B.—R. W. P.—F. P.—H. A. M.—H. F. T.—J. W. W.—E. W. S.—S. S. & Co.—H. D.—P. T.—T. E. S.—R. C.—W. G. C.—T. R.—E. W. W.—P. J. R.—A. J. M.—A. McR.—J. G. H.—A. E. B.—W. S.—C. D. R.—R. L.—C. W. M.—R. B. C.—W. C.—M. E. P.—C. H. A.—A. J. M.—F. T.—J. T.—A. S. W.—M. E. P.—T. R. D. C.—G. W. R.—J. H.—F. W. L.—F. W. P.—C. & H.—W. G. W.—F. R. B.—H. F.—K. H. J.—G. F. B.—S. L. M.—T. S.—E. W. S.—H. W. P.—J. W. W.—W. H. B.—etc., etc.

NATURE ROUND FOLKESTONE.

THERE is a rural charm about Folkestone which renders it almost unique amongst seaside watering-places. There one can walk beneath the towering cliffs which bound the front of the town, and enjoy the lung-filling sea-breezes and the nostril-pleasing scents of the verdure-covered slopes, and yet remain delightfully ignorant of the very existence of the town above. One can ramble there among unconventional paths and lanes which intersect with careless but pleasing taste the plateau-like expanse beneath the cliffs, amidst such rural simplicity of tree and flower, which is often so painfully lacking in some of the more fashionable resorts. We have the sea on the one hand, of which we get a peep through the breaks in the foliage, or under the grotto-like bridges which span some of the paths to the beach, whilst on the other hand we have the tall cliffs, some two hundred feet high, covered from top to bottom with eye-refreshing verdure, and cut through in zigzag fashion by the picturesque sloping paths which lead the weary traveller to the breezy plateau of the Lees. Pine-woods flourish on the slopes, nourished by the sandy loam in which they have to spread their roots; here the mulberry and the elder cover the grassy banks, whilst the wild poppy and others of nature's weeds add their beautiful freshness to gratify the rest-seeking eye.

The very wildness of the slopes, the unconventional manner in which nature is allowed full scope for her idiosyncrasies, shows that their owner—for are we not reminded by notice-boards, ostentatiously placed, that the cliffs are private property—is alive to the demand for the beauties of nature in preference to the triumphs of art. Asphalted paths are fortunately few and far between, the undercliff road has no smooth curbing of foreign sandstone, and in the place of artificial landmarks, blocks of unhewn native rock give refreshment to the eye, which elsewhere than in Folkestone is wearied with conventionalism and regularity.

Then at one end of the rural Lower Road, as it is called, have we not a good old-fashioned turnpike-gate, and are we not half-inclined to long for the re-appearance of the Rebeccaites, who were to possess the "gates of their enemies," in order to free us from this relic of a bygone age? And yet, perhaps, it is but in keeping with the rest of the landscape, and its removal might be the commencement of many other so-called improvements. Nay, let the wild flower here still grow wild, let the thistle and the nettle still grow to their present alarmingly large proportions, and let the unhewn blocks of neocomian sandstone long serve in place of the art-delved product of a foreign quarry.

But the natural beauties of the town were only possible where the geological foundations were such as here obtain, and perhaps it would be well to consider the underground features which are here met with.

No one who visits the town fails to pay a visit to the Warren, which is but a short and pleasant walk from the eastern end of the town. This is a geological feature which will serve as our coign of vantage from which we can proceed to survey the geological formations on which the town rests. The Warren is a wild tract of land which, from the ruggedness of its beauty, constitutes one of the chief and most pleasant attractions which the town possesses, and as such should be regarded with a jealous eye by the town authorities. It has been enthusiastically called "Switzerland in Miniature," and although the analogy may appear somewhat far-fetched, yet there is something in its valleys and miniature mountains, in its steep and undulating mountain-paths, which may afford some pretext for the application of that ambitious title to it. There the wild flowers grow in profusion, and blossoming shrubs cover many of its banks ; there the heather is found carpeting the soft soil with a hue of purple and of crimson ; there, too, the earth-cracks and the miniature precipices, the narrow crevasses and the treacherous mud-glaciers, as we may almost call them, bear witness to many an earthquake on a small scale, caused by the collapse and fall of the cliffs of shifting gault-clay.

The geological conditions of the soil have here a most immediate effect upon the conformation of the neighbourhood. As we approach Folkestone from Dover, we find a narrow strip of ground, gradually increasing in width, appearing between the chalk-cliffs and the seashore. There is, in fact, at that part where the Warren railway-station is situated, a double line of cliffs, the taller and more majestic of the two being situated behind the railway, and the lower line of cliffs bounding the present seashore, whilst the railway-line runs along the platform formed by the latter. Platform it can scarcely, however, properly be called except in this particular part ; since it soon loses its table-like condition, and is thrown up in every direction into miniature hill and dale, whilst the stagnant ponds which lie here and there in a quiescent state of undisturbed repose, testify to the existence of an under-soil of different consistency to that of the visible chalk. This is where the gault-clay has cropped out, and where, unable to bear the heavy load of chalk upon its back, it has given way and borne the chalk along with itself in pell-mell confusion on to the shore below.

As we pass on, and follow the curve of East Wear Bay, we leave the line of chalk-cliffs, which proceed hence inland and pass a mile or more in the rear of Folkestone. The gault is here in full force, and has slipped down into the sea by a series of swell land-slips, forming, instead of a single steep cliff, a gradual approach to the sea by a series of slopes and narrow platforms, where wild flowers, grasses, and bushes grow in profusion on a rich soil, and bring the attributes of the meadow down to the verge of the sea.

There is little doubt that were this formation its one and only protection, it could not fail to be rapidly denuded by the sea. But it is protected by cliffs of the lower greensand formation, which makes its appearance as we round the point by the Martello Tower. The huge blocks of sandstone which here lie in immense profusion, and which cover the fore-shore beneath the cliffs of the same material, as far as the harbour breakwater, afford as secure a protection on the south to the softer gault formation, as the chalk provided on the north of the bay. The lower greensand strata are again observable in the cliffs beneath the Lees where not covered by verdure, and the various subdivisions of Folkestone, Sandgate, and Hythe ; beds are observable as approach is made to the last-named place, some four miles to the west of Folkestone.

In the sandstone blocks little is to be seen in the shape of fossil remains, ostreidæ being among the most noticeable ; such fossils as there are, are usually so embedded in the matrix as to render it difficult to remove them in a perfect condition. The usual fossils of the chalk are to be met with, although not found in any very great profusion, but it is to the gault that the collector turns his attention, more particularly when visiting here.

At the innermost corner of East Wear Bay, where the chalk and gault are most amenable to the disruptive agencies of sea and air, the contained fossils have been spread out upon the stretch of muddy sand here laid bare at low tide. Occasionally an *inocoramus*, a *terebratula*, or a *rhynconella*, bearing unmistakable traces of their cretaceous origin, is found ; but most of the fossils are those which have been washed out of the gault, and which, in the majority of cases, are found mineralised into iron pyrites. This especially refers to specimens of the *nautilus*, *arca*, *pentacrinus*, *ammonita*, and *hamite*. In some of the little pools which have been left by the retiring tide, and into which the last under-currents are draining their burdens, the fragments of fossils can be taken in great numbers, but perfect fossils are comparatively rare. Many small ammonites which are found, covered by iridescent nacre, and shining in the rays of the sun, are but the central whorls of possibly much larger ammonites. Where they are met with intact, imbedded in the stiff mud, their tendency is at once to break up on being removed from the matrix. Their saturation by the salt water seems to have loosened the connections along the lines of their sutures, so that the configuration of the interior of their chambers is laid open to view, and the irregular lines of the sutures can be easily studied. The latter are well worth examining, the distinction between those of the ammonite and of the nautilus being in these specimens easily recognisable. The ammonites which have been preserved in mineral, do not exhibit this tendency to break up to the same extent.

Owing to the rough treatment which the specimens have received from the sea, the *hamites*, *scaphites*, and *ancylocoras* are only found in a fragmentary condition. They, however, exhibit sufficient of the curve to show their shape if perfect, although not sufficiently to be distinguishable from one another.

One of the most noticeable products of the sand here is the quantity of pyrites which is strewn about, in all shapes and sizes, sometimes taking the form of an organism, sometimes being in the shape of a circular ponderous mass, and at other times existing as small aggregations of beautiful crystals. The faithful likeness which it has reproduced of organic creatures, is shown well in the small closed-up flowers of the *encrinite*, in the delicate markings on the shell of the *echinoderm*, or in the more bulky mass of mineralised sponge or coral.

To show how prolific the formation is in organic remains, the following list is appended; about one-half were comparatively rarely met with, small ammonites, particularly portions of them, being perhaps the most plentiful.

Brachiopoda.
Terebratula.
Rhynconella.

Polyzoa.
Brachiolites spongida.

Lammellibranchiata.
Inocoramus sulcatus.
Do. concentricus.
Cucullæa glabra.
Do. carinata.
Plieatula pectinoides.
Arca.
Kemus tenera.
Cardita tenicosta.
Pecten.

Actinozoa.
Plocoscyphia labrosa.
Cyclocyathus Fittani.
Trocosimbia sulcatus.

Annelida.
Vermicularia concada.

Gasteropoda.
Twoidites elegans.
Do. senequierianus.
Rostellaria carinata.
Aporochais orbiquiana.

Cephalopoda.
Nautilus clementinus.
Ammonites symmetricus.
Do. lautus.
Do. communis.
Do. tuberculatus.
Do. auritus.
Do. Bouchardianus.
Do. splendens.
Do. Bendantii.
Scapites æqualis.
Hamites.
Belemnites attenuatus.
Do. minimus.

Crinoidea.
Pentacrinites Fittoni.

Echinoidea.
Hemiaster minimus.

One specimen of a fossil nut was also found, resembling somewhat in shape and size the stone of a damson.

From this list it will be seen that to those who know what to look for, and who are able to see differences in specimens which to the ordinary eye give no sign, a goodly increase in one's collection will accrue from a few visits to the Warren.

It should be stated that the specific differences amongst the ammonites have been quoted from the Jermyn Street collection. As some species have been named from their shapes, as *symmetricus*, *communis*, etc., and others from external appearances, such as, for instance, *aurites*, *splendens*, etc., and as certain specimens have been found to possess characteristics of more than one species, some of the specific names are superfluous, and the number and names of the various specimens in the above list should probably be reduced.

What a pity it is that there is not some central academy of science, which should sit in solemn conclave, and decide authoritatively on the specific name which any newly-discovered species is to bear.

NOTES ON NEW BOOKS.

An Account of British Flies (*Diptera*), by F. V. Theobald, vol. i. (London: Elliot Stock). We have frequently called attention to this important work as the parts came out. In its entirety it makes up a handsome and attractive volume. No other order of insects has been so much neglected as the Diptera, and it was for that reason we gave prominence to the series of papers in our columns, by Mr. Brunetti, two years ago. The Diptera is a new hunting-ground for the entomologist who has had enough of lepidoptera and coleoptera. Let him get Mr. Theobald's present volume, and go farther afield. Walker's work on the subject is now out of print. Mr. Theobald's book is well illustrated with woodcuts and plates.

The Birds of Derbyshire (London: Bemrose & Sons), by F. B. Whitlock. This is a first-class book and one which every Midland ornithologist should not fail to procure. It is tastefully bound in a strong, plain cover, and is illustrated by first-rate photographs and sketches. The paper is of very fine quality, the print fairly large, and altogether it will be found a most readable book. After an introductory chapter, Mr. Whitlock goes on to take each species separately, and to record any notes obtainable, which bear upon that special species, ending up with a general summary, in which he states that in Derbyshire there are to be found a hundred and ten breeding birds, or a grand total of one hundred and forty-six species.

The Earth's History, by R. D. Roberts, M.A., D.Sc. (London: John Murray). Dr. Roberts adds one more to our numerous geological text-books, under a somewhat ambitious title. The volume is nicely got up, and contains several useful maps, printed in colours; but beyond this the book contains only the well-known materials worked up again.

GOLD-TAILS AND BROWN-TAILS.

A MOTH of very delicate beauty, with wings of snowy whiteness, was generally very abundant last year. The body is pure white, too, all but the tail-end, which terminates in a tuft of golden hairs in the male, and in the female is increased in size almost to a little button, or knob. These golden tufts give it its name of gold-tail: in science, *Liparis auriflua*. The moth, like many other beauties, is deceptive, and not innocuous, as persons who handle it, and especially those with delicate skins, will soon find out to their cost. It possesses a property known as "urtication;" in other words, it stings like nettles, to the well-known smart of which, an intolerable irritation is thrown in, in order to make it more pleasant (?). This property is even more pronounced in the larvæ, or caterpillars, which in the spring may be seen in swarms on the blackthorn and whitethorn hedges. They are extremely pretty, in fact showy, creatures, with stripes of bright scarlet, and white tufts of hair. Though the caterpillar has an evil repute, it does not seem to be known that the moth is capable of urtication. A non-entomological brother of mine captured one of these moths, intended as a surprise for me, and having no box with him, converted his hat—not a boxer, for then there might have been more room—into a receptacle for it. On reaching home he secured the moth. Shortly after, his forehead came out into numerous little white bumps, which irritated him beyond endurance, and the more he attacked them the worse they became. In some alarm he consulted his medical man, who told him that there was no doubt that he had checked the perspiration, and prescribed a draught and a lotion—inside and outside applications! On mentioning the occurrence to me some time after, and how he had disposed of the moth, the mysterious bumps were explained, and we both had a hearty laugh at the doctor's expense. Now, the cause of irritation is in some way connected with the hairs of both caterpillar and moth; but entomologists cannot yet decide whether their effect is simply mechanical, or whether they possess poisonous properties besides. The moth is about the size of the small garden white butterfly. There is a species identical in appearance, except that the tail in this insect is brown, called therefrom the brown tail, (*Liparis chrysorrhœa*) which I used to take abundantly on the hedges by the canal here, both in the caterpillar and moth stages, ten or twelve years ago. The caterpillar is much more soberly dressed than the gold-tail, having no scarlet, nor white about it. Singularly enough, although I search for it regularly every year, the caterpillar and moth have entirely disappeared, and what is more curious, apparently throughout the country, no records of their occurrence having been made for several years.

JOSEPH ANDERSON, Jun.

Chichester.

THE BLUE-BOTTLE FLIES.

A SAD TALE OF SUFFERING.

By the Author of "Insect Variety."

ONE of the most shocking cases of scholechiasis I ever met with, says Mr. Kirby in his "Introduction to Entomology," is related in "Bell's Weekly Messenger," in the following words:—

"On Thursday, June 25th, died at Asbornby, Lincolnshire, John Page, a pauper belonging to Silk-Willoughby, under circumstances truly singular. He being of a restless disposition, and not choosing to stay in the parish workhouse, was in the habit of strolling about the neighbouring villages, subsisting on the pittance obtained from door to door; the support he usually received from the benevolent was bread and meat; and after satisfying the cravings of nature, it was his custom to deposit the surplus provision, particularly the meat, betwixt his shirt and skin. Having a considerable portion of this provision in store, so deposited, he was taken rather unwell, and laid himself down in a field in the parish of Scredington, when, from the heat of the season at that time, the meat speedily became putrid, and was of course struck by the flies. These not only proceeded to devour the inanimate pieces of flesh, but also, literally, to prey upon the living substance; and when the wretched man was accidentally found by some of the inhabitants, he was so eaten by the maggots, that his death seemed inevitable. After clearing away as well as they were able these shocking vermin, those who found Page conveyed him to Asbornby, and a surgeon was immediately procured, who declared that his body was in such a state that dressing it must be little short of instantaneous death; and, in fact, the man did survive the operation but a few hours. When first found, and again when examined by the surgeon, he presented a sight loathsome in the extreme. White maggots of enormous size were crawling in and upon his body, which they had most shockingly mangled, and the removing of the external ones served only to render the sight more horrid."

Although among the buzzing tribes of carrion insects the perpetrator of this dire tragedy is involved in gloom, suspicion clearly points out the butcher's blue-bottle, the *Calliphora vomitoria* of science, as the agent These are truly the race of Beelzebub, hastening with groping scent to the first sickly taint of decay, and hurrying their eggs from their bodies as newly-hatched maggots, eager to hasten the progress of dissolution with their jaws and putrifying excrement. In them the assassin's knife and druggist's art are seen, and there was a moment when we were led to surmise that the blue-bottles of Paris were as instrumental in war as the blood-stained swords of Germany. But to understand fully this diabolical blue-bottle instinct, we must visit in our dreams that new land discovered by Columbus, those Edens of the western wave, dear to fancy; where love-lorn maidens pass the idle hours swinging in the chequering shadow, and fanning the soft air with painted plumes; where the rivers warble on golden sands, and nature pains with her beauty.

No theatrical placard ever read with a more sensational thrill, than the following lurid heading to a scientific paper, to be found in the "Boletin de la Academia Nacional de Ciencias," of the Argentine Republic: "A new case of myiasis observed in the province of Cordova in the Argentine Republic, and in the Republic of Venezuela," by P. Auguste Conil. It is a dark tale of human suffering hung with forest gloom, whose loneliness whets the razor-edge of despair.

"The house situated beside mine," says Monsieur Conil, "is occupied by M. Augustus Ortiz, whose family inhabit Le Totoral, a village situated twenty leagues to the north of Cordova, close to the railway which connects this town with that of Tucuman. One of his sisters, Josefa Ortiz, aged eighteen, fell sick, and experienced such acute pains that she decided to consult a doctor who, having made his interrogations and examinations, declared her attacked with angina, and treated her for this affection. In spite of all the remedies administered, far from the pains abating, they on the contrary augmented in intensity, and her mother, justly alarmed by the state of the young invalid, who got worse from day to day, wrote to her son to consult another practitioner at Cordova. M. Augustus Ortiz immediately called on Dr. Lesbini, and gave him the details of the malady contained in the letter. On the relation of the sufferings the sick girl experienced Dr. Lesbini recognised the same indications and the various symptoms which he had observed in Ramona Marchland, whom he had previously attended and cured. The analogy of the pains experienced by the two, did not leave any doubt but that the malady was myiasis in the nasal fossc and frontal sinus, and he consequently ordered injections to be made through the nostrils with a decoction of basil and a solution of salic acid. He also recommended that the invalid should be brought immediately to Cordova, in order that she might be more under the instant remedies and care of the faculty.

"The letter which led Dr. Lesbini to these conclusions, ran as follows:—Sunday, the 5th January, 1878, Josefa Ortiz commenced to complain of insupportable itchings in the right nostril, and the same day she experienced several bleedings at the nose. The following days she suffered violent pains in the face, in the nape of the neck and in the throat. The town doctors' conclusions in regard to the condition of the poor sufferer proved only too painfully true, and might serve as a protest against all country practitioners.

"On Tuesday the 14th January, nine days after, her palate was perforated, and two maggots, sufficiently developed, escaped by the right nostril. Her pains now became more and more violent, and her brother Augustus Ortiz, being warned, set out for Totoral. Arrived at home, the state of his sister appeared so grave that he resolved to take her with him to Cordova. He gave a minute narration of the consultation he had had with Dr. Lesbini, according to whose opinion the illness of Josefa was produced by the maggots, which had been deposited by a fly as eggs in her nose. Her parents, in spite of the eighty-two maggots that had issued, could not be brought to believe in such an assertion, in their ignorance it appeared an impossibility, that these worms that they had seen could be the young of a fly; they could not comprehend how any relation could exist between them and a fly, and they doubted it the more when the invalid girl affirmed that no fly had introduced itself into her nose.

"Struck, however, with the narration, Elisa, a younger sister of the invalid, related that the fore-vigil, a fly had entered into her right nostril, and that during the afternoon she had experienced the same symptoms as Josefa had at the commencement of her illness. On hearing this the family commenced to persuade themselves that Dr. Lesbini was in the right. The departure being resolved upon, it was decided that they should leave by the first train, and that they would take Elisa with them on the journey, a decision to which the maiden indubitably owed her life.

"On Saturday, the 18th January, at ten minutes after noon, they entered the train at the station of Jesus Naria. At half-past one Josefa got down from the carriage and walked a moment; at fifty minutes past two the train drew up at the station of General Paz, and already her condition is so aggravated that her family, plunged into the greatest anxiety, believes she will never arrive at her destination. At three o'clock when the train again starts, Josefa is deprived of her senses, and shortly after leaving the station of General Paz, she expires in the arms of her forlorn mother.

"Her body, transported to the house of her brother Augustus, was immediately examined by Dr. Lesbini, who forthwith summoned two fellow-practitioners, the first of whom desired to make an autopsy, an operation to which the family made formal opposition. The next day, Sunday, January 19th, the body of Josefa Ortiz is carried to its last resting-place, or as her historian pathetically recounts it, 'Josefa is carried to her last abode; truly, as the patriarch has it, the bloom of the morning has been crushed before the worms.'

"Let us now turn to her sister. Wednesday the 15th January, at the hour of the siesta, Elisa Ortiz, aged fifteen, Josefa being already very ill, was reclining upon her bed engaged in reading; the heat was quite suffocating, and Elisa lay in that state of unconsciousness neither asleep or awake. We know not what delusive fancy charmed or what harmony floated around, when suddenly she felt something introduce itself into her right nostril. She immediately rose, and, having at hand a sneezing powder, she inhaled one or two pinches repeatedly. In one of the sneezes provoked by this powder she saw, she affirmed, a golden fly fall from her nostril, which could not have remained there but from one-and-a-half to two minutes at the most. She at first took no account of this circumstance, not supposing that lamentable consequences would result to her, and being very far from imagining that the fly in question had come to deposit its progeny in the nasal fosse, and give birth to a population which would shortly occasion her atrocious suffering.

"It was on Friday, the 17th, towards noon, that Elisa, hearing her brother Augustus relate the opinion Dr. Lesbini had pronounced on the cause of the malady of her sister, recollected what had taken place on the fore-vigil of St. Marcellus, and told it to her family. That very evening she had frequent sneezings and bleedings at the nose, and she commenced to experience slight pains in the throat, the auditory duct, and in the right side of the face. At the sight of these symptoms, analogous to those which the malady of Josefa had presented at the outset, Elisa was made to breathe a decoction of basil contained in a solution of salic acid, the remedy Dr. Lesbini had prescribed for her sister. These inhalations, although many times repeated, did not, however, give any result. As a measure of precaution the perturbated family resolved that Elisa should accompany her sister to Cordova, so as to be able to take care of her in case she saw her attacked with the same symptoms as herself.

"During the evening of Saturday, the 18th, Dr. Lesbini examined the young invalid for the first time, and pronouncing it a case of myiasis, he personally made injections of chloroform and the essence of turpentine attenuated in water. No maggots appeared in consequence of these injections, but in spite of the glimmering hope remaining from a negative result, and unpersuaded by the doctor's diagnostics, the family remain in the most forlorn condition, for they are perfectly persuaded, whether produced by a fly or not, the illness of Elisa is the same as that which hurried their other child to the grave, and what they endured in the case of Josefa, they now feel for Elisa.

"Sunday, the 19th, the invalid complained much of pains already grown acute, and a headache becoming more and more acute, and when Dr. Lesbini repeated his injections in the morning, small whitish masses came forth with the liquid, which resembled maggots in embryo. Towards three o'clock in the afternoon an injection with chloroform brought forth a living grub, and the remedy was thereupon repeated several times, but without any further result. At nine o'clock in the evening new injections with a decoction of basil were administered, and fifty grubs fell from the nostrils.

"The following days the pains continued to augment in intensity. The injections were regularly repeated thrice every twenty-four hours, and up to Thursday, the 23rd, the maggots, in greater or less numbers, continued to fall from the right nostril. That day the pains beeame so intolerable, that the young girl gave fearful shrieks, and implored that we should rather leave her to die than torment her so. On Friday, the 24th, two maggots, more developed than any hitherto obtained, escaped from the nasal fosse, and the invalid only gave intimation of slight pains on the right side near the frontal region, in spite of which two more maggots, alive and excessively developed, issued during the night. Saturday, the 25th, the sufferer experienced no pains and felt perfectly well; at the injections with the solution of salic acid she sneezed frequently, but only returned masses of whitish matter, evidently the shreds of the pituary membrane mangled by the mandibles of the maggots. During the night a last maggot arrived at its maximum growth, and seeking, probably, the earth to bury in and undergo its transformation, fell from the nostril.

"Elisa Ortiz," adds the writer, "is at present radically cured, and if it were not for her emaciation, it would never be supposed that she had passed through so terrible an ordeal. Otherwise it is not astonishing that the hideous malady in question, should have left some marks on its victim, and yet the only symptoms that have declared themselves hitherto, are a slight tumefaction of the nose, arch of the eyebrow and cheek, to which we must add, the sneezings, bleedings at the nose, and the evacuation through the right nostril of a bloody-purulent mucus with an infectious odour. Thus marred and disfigured in the pride of beauty, the young Spaniard returned to her village, recluse in the southern continent of the new world, promising never again to be seen in such a condition."

In the interest of science Senor Conil made a study of the maggots that had thus surely struck their quarry as lambs for the slaughter, and to this end the twenty which had remained alive from the injections of the 19th of January, and which had attained five millimetres, or about the fifth part of an inch, in length, were collected in a glass. These were then fed on meat, which it was found necessary to change daily, on account of the viscous green liquor which they emitted accelerating putrifaction, an operation demanding not a little exercise of fortitude on the part of the delicately organised operator. This process was continued until the 23rd of January when, instead of penetrating the fresh meat as was their custom, the maggots commenced to roam restlessly until arrested as though paralyzed, they remained motionless, surrounded with a viscous yellow substance. The next day five had assumed the form of chrysalides, which, at the expiration of another eleven days, turned to flies resembling the common bluebottle, of a metallic green colour with blue reflections. Here, as is commonly the case, the labours of the entomologist terminated, for although it was surmised that the uniting of the sexes was witnessed in the breeding-cage, it was not possible to induce the females to oviposit, and so monograph their entire history, concerning which ample detail is given. These flies, to distinguish them from the European blue-bottle and cogeners, have received the very shocking name of man-eaters, *Calliphora anthropophaga*.

In the early days of colonisation, when a poetic fancy clothed the face of the Argentine landscape with fables drawn from a classic source, or the inharmonious haze cheated the sense, and every object was a new marvel, these terrible scourges of humanity gave rise to a somewhat prodigious story detailed by Mr. Kirby. In Paraguay, he tells us, the flesh-flies are said to be uncommonly numerous and noxious. Azara relates that after a storm when the heat was excessive, he was assailed by such an army of them, that in less than half-an-hour his clothes were quite white with their eggs, so that he was forced to scrape them off with a knife; nor was this modern St. Sebastian unaware of the malevolence of these javelins. He had known instances of persons who, after having bled at the nose in their sleep, were attacked by the most violent headaches; when at length several great maggots, the offspring of these flies, issuing from their nostrils, gave them relief: what precarious relief the sequel fully intimates. In Jamaica a large blue fly of a similar description buzzes about the sick in the last stages of fever, and when they sleep or doze with their mouths open, the nurses find it very difficult to prevent these flies from laying their eggs in the nose, mouth, or gums.

An instance is recorded of a lady who, after recovering from a fever, fell a victim to the maggots of this fly, which from the nose, found their way through the *os cribriforme* into the cavity of the skull, and afterwards into the brain. Dr. Sells likewise tells of flies being hatched in the human body in Jamaica (of the blue-bottle kind); in one instance, in a neglected blister on the chest; in another, in the gums and inside the cheek; in a third, in the ear; and in a fourth, in the passages of the nostrils, out of which the negro who was the sufferer counted not fewer than two hundred and thirty-five maggots. which in a fortnight dropped out, by applications of oil and tobacco smoke.

POISONOUS PLANTS AND THEIR POISONS.

By J. Guardia, F.R.M.S.

NOT only to naturalists, but to every reader, some knowledge of poisons is, I think, likely to prove welcome. Everyone must be aware of the great lack of satisfactory information on this head, as is painfully evident from the almost daily reported cases of death or illness through poisoning—cases which are the more distressing when we consider that most of them might have been avoided by even a slight acquaintance with the dangerous substances with which we are surrounded.

But it is scarcely from a medical point of view that I wish to treat of poisonous plants—this has been done in several excellent English and foreign treatises. What I desire to do is to present a new field of enquiry to those who have not previously paid any attention to the most wonderful properties developed in the world of plants; and also, by giving a series of remarkable facts, to induce an interest in our plants for their own sake, and thus, possibly, to counteract the too general tendency (chiefly) among young collectors, to consider each new specimen merely as hay of a different shape, fit only for another sheet in their herbarium!

We will examine the nature and effects of the different poisons, and, after passing in review the most poisonous plants of our native flora (with a few of the most noteworthy exotics), we shall attempt to explain how and why their poisons were produced.

What is a poison? and however easy to answer it may at first appear, it will be found by no means so. The dictionary's definition of the term is notably incorrect. The dictionary has it, that a poison is "that which is destructive or injurious to vitality." Now this sounds well enough, yet it is not sufficient. A poison is a substance which can exert, by its chemical action, an injurious influence on the vitality of a healthy organic body or tissue.

But it must be acknowledged that to define correctly what a poison is, is very difficult, if not impossible, as many substances injurious to some organisms are by no means so to others. For instance, the deadly nightshade and the henbane do not poison pigs. The water-hemlock, so dangerous to man and notably so to cattle, is perfectly harmless to dogs, as is the celandine to sheep and the spurge to goats. Noteworthy, too, is the case quoted in the "Origin of Species" of white sheep and pigs being injured by certain plants, whilst dark-coloured individuals escape. "Professor Wyman," adds Darwin, "has recently communicated to me a good illustration of this fact; on asking some farmers in Virginia how it was that all their pigs were black, they informed him that the pigs ate the paint-root, *Lachnanthes*, which coloured their bones pink, and which caused the hoofs of all but the black varieties to drop off" ("Origin of Species," 6th ed., p. 9). The toxic effects which such vital substances as blood and pollen produce in some cases are most remarkable. A few drops of the blood of a mammal, if introduced into the circulation of a bird, causes a certain and intensely violent death by the instantaneous destruction of the vitality of its nervous system (Dieffenbach). Fritz Müller has recorded some species of plants, the pollen of which, if placed on the stigma of the same flower, acted on it like a poison, the flower fading and falling off, and the stigma turning brown and decaying. Sugar is said to kill almost instantaneously some reptiles, like frogs and lizards. The dose or quantity of a substance required to poison an animal also differs greatly: whilst a very small quantity of opium is sufficient to kill a man, it requires two drams to kill a dog, and as much as two ounces for a cow; yet one ounce given to sheep, it is said, will have no bad influence on these animals. Swallowing two or three drams of arsenic will have no dangerous consequences for a horse. Man, as well as animals, can gradually become used to some poisons. Mythridates, king of

Pontus, had made a special study of poisons, and had even written a book on them. He accustomed his body to the strongest of them by taking at first small but gradually increasing doses, so as to protect himself against being poisoned. The opium-smoker can stand a quantity of that drug that would be most dangerous to us.

In spite of these anomalies, the definition of poison given above is probably correct, and keeping it in mind we will now throw a rapid glance on the nature of poisons. Poisons are represented in all the three kingdoms of nature; there are, therefore, *animal*, *vegetable*, and *mineral* poisons. And without taking into account the kingdom from which they proceed, poisons may be again divided by the different modes of action of their deleterious effects. Those called acrid or irritants act by inflaming the parts with which they come in contact. The plants whose poisons belong to this class are the spurge, colocynth, savin, most *Ranunculi*, the meadow-saffron, water-dropwort, etc. The narcotics, without producing any immediate change on the surface exposed to them, act on the brain and nerves, inducing a tendency to insensibility and torpor. The principal are the henbane, bitter-sweet, *Lactuca virosa*, and all plants containing opium or prussic acid. The third class, that of the narcotic-irritants, partakes of the qualities of the other two classes, and comprises the strongest poisons. The most common plants of this class are the deadly-nightshade, thorn-apple, tobacco, foxglove, hemlock, cowbane, "nux vomica," and the poisonous fungi. Camphor, turpentine, ether, and alcohol also belong to these.

The toxic properties of plants are due to certain substances contained in them, most of which have already been studied and extracted by chemists. These substances are generally of an alkaline nature, and called *alkaloids*; some are acid. The vegetable kingdom produces about 1000 alkaloids, of which about 200 have become at all accurately known—a good number, considering that their existence was discovered only three quarters of a century ago, i.e., by Lerturner in 1816. Most of them are violent poisons; amongst the best-known I may name morphine, codeine, strychnine, aconitine, nicotine, coneine, atropine, hyoscyamine, etc. The acids are either united to alkaloids or to oils.

There are various ways by which these poisons may be accidentally introduced into the system. Through the nose, in the form of odours; through the lungs, by inspiration; by the mouth, in the form of food; through the skin, by absorption; and, very readily, by recent wounds. They act either on the nerves, and brain, on the blood, or on the tissues of the body. Opinions seem to differ as to whether poisoning in general takes place primarily through the nerves or through the blood, and facts are brought forward to support both theories. It is, for instance, said on the one hand, that after cutting the gastric nerves no poisoning takes place in some cases, and that a solution of emetic tartar, if injected into the veins causes nausea in the stomach by acting through the nerves. On the other hand, it is stated that prussic acid, which otherwise acts on all tissues, animal and vegetable, has no influence whatever if brought in contact with the nerves only. Strychnine produces no effect unless it gets into the blood, as the celebrated German physiologist, J. Müller, proved by the following interesting experiment that poisoning cannot take place through the nerves alone. He exposed the nerves of the legs of some toads, so that the calf and thigh were only connected by the bones and nerves. Then he placed the legs for a long time in an acid solution of morphine and a concentrated solution of opium. Many hours afterwards the toads were still alive and perfectly sensible.

It seems, however, that poisons in general, whichever way they may be introduced into the body, kill by finally acting on the brain through the nerves. It is worth noticing that opium, morphine, belladonna, alcohol, etc., chiefly act directly on the brain; strychnine, tobacco, and camphor on the spinal chord; aconite, cicuta, colocinth, and colchicum on the ganglion system. The upas and wourali poisons, like that of venomous snakes, act by altering and decomposing the blood.

Of all poisons, those of vegetable origin are perhaps the most common and certainly the most violent. Unfortunately they are also the most difficult to determine, for whilst nearly all mineral poisons are well-known and comparatively easy to analyse, and the poisons of animals readily obtained in a pure state for study, the poisons produced by plants can only be extracted after a lengthy process of distillation—too lengthy, indeed, and besides too varied, to be described here. The toxic agents of many plants have not been discovered yet, and of those that are known, only a few, such as strychnine, morphine, brucine, etc., have been subjected to a thorough study. The result of this is, that whilst there are numerous tests by which to identify mineral poisons, the determination of the vegetable alkaloids is, mostly, very uncertain. The toxic products of plants are determined by two methods, i.e., by their reaction when subjected to certain chemical agents or to the blow-pipe, and by a microscopical examination of the crystals of the alkaloids. As to chemical tests the following may be of interest:—

Iodic acid stains all vegetable alkaloids brown.

Morphine gives a blue stain with chlorate of iron or gold; sulphuric acid turns it first yellow and then red.

Strychnine.—Sulphocyanide of soda, if introduced into a solution of strychnine, soon causes the crystallisation of the alkaloid.

Veratrine is turned milky by the same reagent.

Emetine is turned milky by the same reagent, and yellow by chlorate of platinum.

Brucine is turned first pink by concentrated sulphuric acid, and then deepens to blood-red.*

The crystallisation of alkaloids is of a very constant character in each case, and the microscopical examination of their crystals often enables us to identify the alkaloids when other means fail, on account of their not being affected by the usual reagents in the very diluted state in which they are sometimes found. Here, then, we must again seek the aid of the most entertaining, and at the same time, most useful of scientific instruments—the microscope, and we shall obtain, as usual, the most surprising and wonderful results. The smallest crystals of alkaloids can be determined by examination under the microscope. Dr. Wormley states that microchemical analysis enables us by a very few minutes' labour to recognise with unerring certainty the reaction of the 100,000th part of a grain of prussic acid or arsenic. Fluids containing alkaloids in such minute quantities as would not answer to chemical procedure may be detected in the following way:— A drop of water containing infusoria is placed, uncovered, on a slide. and whilst this is being examined under a suitable power, a little of the suspected fluid is applied, when, if an organic poison be present, the infusoria will fall in a formless sediment. The 15,000,000th part of a grain of atropine, it is said, may be thus detected! (Professor Rossbach). In fact, as the late Dr. Carpenter says, in the last sentence of his work on "The Microscope," "By the careful prosecution of micro-chemical inquiry, especially with the aid of the spectroscope (where admissible), the detection of poisons and other substances in very minute quantity can be accomplished with such facility and certainty as were formerly scarcely conceivable."

After this necessarily short sketch of the nature, properties, and effects of vegetable poisons, I will proceed to enumerate, as briefly as possible, the different cases in which poisons occur in the plants of the British flora, etc.

The first natural order, that of the RANUNCULACEÆ, is a very poisonous one, almost all of its members possessing more or less strong acrid or narcotic-acrid properties.

Anemone pulsatilla, nemorosa.—The pasque-flower and wood anemone contain an acrid alkaloid, anemonine, which acts chiefly as a caustic by inflaming and blistering the skin. 1½ oz. of the fresh juice of *pulsatilla* introduced into the stomach of a dog, caused its death after six hours. *Nemorosa* is not as strong in its effects.

Ranunculus.—Most of our buttercups contain an irritant substance, which is strongest in *acris*. 3 oz. of the juice of *arvensis* killed a dog in four minutes. The juice is so caustic that the hands of children sometimes are inflamed and blistered by grasping their bruised stems in hot weather. Beggars are said to employ them to ulcerate their feet and legs for the purpose of exciting compassion. *R. aquatilis* is destitute of this acrid principle and the others lose it if completely dessicated.

Helleborus fœtidus and *viridis* contain a fatty oil which is a narcotic-irritant. Two dessert-spoonfuls of the infusion of *fœtidus* killed a child in thirteen hours. A decoction of ½ dram of the root of (*H. niger*)* killed a strong horse in ten minutes, and even its pollen is believed to be poisonous.

Delphinium Ajacis and (*Staphis agria*).—The larkspurs produce an acrid alkaloid, delphinine. This is present in the leaves and stems, and, in great quantity, in the seeds, which are very poisonous.

Aconitum napellus.—The pretty monkshood, so often grown in our gardens, is a most dangerous plant. Every part of it is full of a narcotic-acrid alkaloid, the aconitine, of a very deadly nature. When taken it produces a feeling of great constriction in the throat, sometimes amounting to choking, and even a small dose often leads, through madness, to death. Chewing one single seed will cause an alarming and painful swelling of the tongue and lips. The toxic nature of this plant has been known since the days of the Romans. The resemblance which its leaves bear to parsley, and its root to horse-radish, render it all the more dangerous. The root of the monkshood is fusiform, black, and gives off numerous rootlets; that of the horse-radish is much longer, of a more uniform thickness throughout, yellowish in colour and with only a few root-fibres. The juice of (*A. ferox*) is so violent that it is used in India for poisoning the arrows of tiger-traps, etc.

PAPAVERACEÆ.—*Papaver somniferum*, etc. The thick milky fluid that oozes from the stem of a poppy when cut is powerfully narcotic, and furnishes the opium of commerce. Opium is obtained from incisions made in the unripe seed-vessel of the oriental plant. It contains several poisonous alkaloids, viz., morphine, narcotine, meconine, thebaine, etc., and its effects have been often described. It acts as a poison on all animals and even on some plants; it can enter the system by different ways and soon diffuses itself throughout. A person has been poisoned by simply holding a lump of opium in the hand on a hot day. In small doses, ½ to 1 grain, it excites all the physical functions and increases the activity of the brain. The dose required to poison a man varies very much with the person and habit, and of course, opium-smokers can absorb a quantity of the poison which to us would prove dangerous. *Laudanum*, an alcoholic solution of opium, in great use for allaying pain, is stronger than a simple aqueous solution thereof, as morphine, the narcotic principle, is readily soluble in alcohol, but not in water. It should,

* For further information on this point see any of the numerous works on medical chemistry, or Wittstein's excellent treatise on "The Organic Constituents of Plants," F. von Müller's translation, Melbourne, 1878.

* Names between parenthesis marks ( ) refer to plants not native in Great Britain.

therefore, be carefully used, as three drops have been known to kill a child. All our other poppies have juices similar in nature to that of the white species, but far less powerful in effect. The odour of the common red poppy, *P. rhœas*, has a well-known, nauseous, stupefying effect.

Chelidonium majus. The celandine has a violently acrid, orange-coloured juice. Its repulsive odour is, perhaps, the cause that cases of persons being poisoned by this plant are very rare. Still, three drams of its extract will kill a dog in a few hours. The juice is said to cure warts and corns.

LEGUMINOSÆ.—This order of plants, which gives us our peas and beans, the clovers and vetches, besides logwood, gum arabic, balsam of Tolu, and many other useful products, also contains some very poisonous plants. And although most of the European species are devoid of any powerful prejudicial action, in some others the presence, in greater or lesser quantity, of a principle called cystine, renders them not only unwholesome, but, in certain cases, decidedly poisonous. The seeds of the beautiful (*Laburnum*) of our gardens, for instance, are considered highly toxic, and those of our yellow vetch, *Lathyrus aphaca*, are said to be unwholesome. (*L. sativus*) causes, if eaten, a strong rigidity of limbs, and these, in some cases, become perfectly helpless. It seems to have a similar effect on some animals. The roots of the kidney-bean is also said to be dangerously narcotic. Amongst the principal exotic poisonous species of this order, may be mentioned *Physostigma venenosum*, the seeds of which are known as the Ordeal Beans of Old Calabar; the bark and red juice of *Erythrophlœum Guineense* are also used as an ordeal in West Africa. The seeds of *Abrus precatorius*, a plant considerably talked about lately on account of its supposed meteorological propensities, are known as crabs'-eyes. They are very poisonous; half a seed (a whole seed weighs about $1\frac{1}{2}$ grs.) rubbed down with a little water and injected into the thigh of a cat will produce fatal effects within twenty-four hours. The roots, on the other hand, are known on the continent as American liquorice. The plant is a common one in the East and West Indies. Several species of *Derris* in the East Indies, and a *Piscidia* of Jamaica, are used to poison fish. No less than one hundred and fifty species of flowering plants are poisonous to fish, as Dr. Radlkofer has shown, and many of these are actually used for fishing purposes. As an illustration of this interesting action of the poisons of some plants, I may here give Bates' description of the way in which a poisonous liana, called Timbó is used on the River Amazons.

"It will act only in the still waters of creeks and pools. A few rods, a yard in length, are mashed and soaked in the water, which quickly becomes discoloured with the milky, deleterious juice of the ᐧnt. In about half an hour all the smaller fishes, over a rather wide space around the spot, rise to the surface, floating on their sides, and with gills wide open. The poison acts, evidently, by suffocating the fishes. It spreads slowly in the water, and a very slight mixture seems sufficient to stupefy them. I was surprised on beating the water in places where no fishes were visible in the clear depths, for many yards around, to find sooner or later, sometimes twenty-four hours afterwards, a considerable number floating on the surface." Fish killed in this manner form perfectly wholesome food.

The ROSACEÆ, to which belong the useful trees that yield our cherries, plums, almonds, peaches, strawberries, apples, and pears, yet likewise produce one of the most deadly of narcotic poisons, i.e., hydrocyanic or prussic acid. It is present in most members of the order, but principally in the almond-tree, the laurel, in the kernels of all stone-fruit, and in the leaves and flowers of the cherry, plum, peach, etc. The oil of bitter almonds is extremely poisonous, and even the exhalation of the leaves of the common laurel is destructive to insect life, as all entomologists know. Cases of children being poisoned through eating the kernels of cherries are on record. Prusssic acid in its pure state kills almost instantaneously, be it inhaled or otherwise admitted into the system. It acts as a powerful poison on all animal organisms without exception, and proves almost as deadly to plants as to animals; so toxic is it, indeed, that its vapour will kill even plants that contain it in solution in their own sap!

CUCURBITACEÆ.—Another large and important order, which includes the melon, cucumber, gourd, vegetable marrow, etc.—*Bryonia dioica*, the white bryony, is the only British representative of this order. Its large rootstock has a nauseous, milky juice of intensely acrid and cathartic properties. The bitter substance, bryonin, derived from it, though much used in medicine, can, when taken in large doses, cause convulsions, stupor, and even death.

(*Ecballium elaterium*) of the south of Europe, etc., produces an acrid juice in its fruit, from which is prepared the substance known as elaterium. When a fruit of this plant is ripe, it suddenly drops to the ground, and through the hole left by the stalk, its poisonous juice (which carries with it the seeds) is squirted out with considerable force. This has gained for the plant the name of spirting cucumber. A case is said to be on record, "when a person was taken dangerously ill from having merely carried a specimen in his hat!"

UMBELLIFEREÆ. — *Conium maculatum.* The hemlock contains an active principle named conia or coniin, which is highly toxic even in small quantities. It speedily kills most animals, but it is said that the plant is eaten by sheep with impunity. conia acts on the nervous system and produces paralysis of the extremities before death, and this has been known to take place, in some instances, within an hour after the poison was taken. The juice of *C. maculatum*, probably mixed with opium, was given by the Athenians to citizens condemned to death, as in the case of Socrates and Phocion.

Cicuta virosa. The water-hemlock or cowbane is still more poisonous than *Conium*. It contains in its sap a volatile alkaloid, cicutine, which is fatal to cattle and man, but is said to have no dangerous effect on horses or dogs. The poison does not seem to develope till the summer months, as cows, it is stated, can eat the plant with impunity in the spring. This is, in a certain degree, analogous with the difference in the power of the poison of adders in cool and hot weather.

Œnanthe fistulosa, *crocata*, and *phellandrium*. The water-dropworts are perhaps the most virulent of umbelliferous plants, and the resemblance of the roots of *crocata* to parsnips, of the leaves of the same and of *phellandrium* to parsley, and of their shoots generally to celery, has led to disastrous results, by their being eaten by cattle and even children. The poisonous principle resides in the yellowish juice.

Æthusa cynapium. The fool's-parsley is another poisonous British umbellifer. Its odour is nauseous, and the plant, when eaten, has been known to give the "lock-jaw," and to cause death in less than one hour. It may be easily recognised by the three or more slender bracteoles which hang from beneath each cluster of flowers.

COMPOSITÆ. — *Lactuca virosa.* The lettuce secretes a well-known milky fluid which, when exposed to the air, hardens and forms the drug known as lactucarium. Athough this juice is strongly narcotic, *L. virosa* is probably not poisonous to man, in spite of its specific name, and its properties, like those of many other plants, have been greatly exaggerated. As an injection the juice seems, however, to have more power, and 36 grs. injected into the jugular vein of a dog, killed the animal in fifteen minutes.

Some of the Compositæ are poisonous to insects, notably (*Chrysanthemum roseum*) which gives "Persian Powder," and (*C. rigidum*) which furnishes "Dalmatian insect-powder;" and our own ox-eye daisy, *Chrysanthemum leucanthemum*, and flea-bane, *Inula dysenterica*, are said to be destructive to fleas.

(LOGANIACEÆ).—Although this order is chiefly tropical and not represented at all in our latitudes, I cannot pass it over unnoticed, as it is eminently poisonous, and affords some of the most toxic drugs known. (*Strychnos nux-vomica*), a native of Ceylon, produces fruit the size of an orange, the flattened orbicular seeds of which contain, in great quantity, two violent poisonous alkaloids, strychnine and brucine, which are largely used in medicine. This plant has a representative in the Philippine Islands, in (*S. Ignatii*), the seeds of which, under the name of St. Ignatius Beans, are largely used for the manufacture of strychnine, Strychnine is, perhaps, after prussic acid, the most virulent of poisons. It kills in a few minutes, and its victims perish after horrible contortions. As already stated, it has no effect if directly applied to nervous tissue. From the bark of (*S. toxifera*) of Guiana, is prepared the dreaded "Wourali" or "Curare" poison, and for a most interesting account of its preparation, uses, and properties, I refer the reader to Charles Waterton's "Wanderings in South America." This enthusiastic naturalist made several visits to the Maconshi Indians of Guiana, with the chief object of collecting some of the poison. As most of the species of this genus are highly toxic, it is remarkable that the fruit of one of them (*S. potatorium*) of India has the curious property of making foul and muddy water quite clear and drinkable, if the seeds are simply rubbed round the inside of the vessel containing the water. It thus plays, in India, the same part as the kola-nut is said to do in Africa.

SOLANACEÆ.—A widely distributed group of plants, characterised by their generally dangerous and narcotic properties. In some species a certain part of the plant may be edible, or even very wholesome, while all the other parts retain more or less narcotic properties. The tomato is an instance; while the leaves, stem, and fruit of the potato are strongly narcotic, and the tuber itself, when grown in the air and light, becomes poisonous. Death has actually taken place from eating this vegetable grown in such conditions.

Atropa belladonna. The dwale or deadly night-shade is, perhaps, of all our poisonous plants, the one best known to be so, and on this account cases of people being poisoned by it do not more frequently occur, for otherwise its berries are not unattractive, especially to children. Its active principle resides in a narcotic alkaloid, atropine, which is present throughout the plant, but in larger quantity in its dark, purple, cherry-like berries. These are highly toxic: very few of them will cause certain death, and even half a berry has sometimes proved fatal to children. The whole plant is so poisonous that merely carrying it for some time has been known to cause temporary paralysis of the hand. Atropine has besides, the peculiar and useful property of dilating the pupil of the eye.

Solanum dulcamara and *nigrum*. The bitter-sweet and the common nightshade are also more or less poisonous, according to the quantity of solanine their sap may happen to contain—this seems to be very variable. The alkaloid solanine is most readily obtained from the sprouts of potatoes.

Hyoscyamus niger. The hen-bane, the active principle of which is the alkaloid hyoscyamine, is not uncommon in England. It is a dangerous plant for man to eat, but not so to cattle, horses, or swine. Horses have been given one to two pounds of the plant without any evil effects. The most powerful parts of the plant seem to be its leaves and seeds, and they will soon cause, in man, giddiness, stupor, and delirium, but seldom death. As a remarkable instance of its effect, I may quote a case, recorded by Dr. Houlton, in which the roots were eaten by the inmates of a monastery for supper. All who had partaken of them were more or less affected during the night and following day. With some, the actions induced were rather ludicrous. One monk got up at

Fig. 68.—Dog's Mercury (*Mercurialis annua*).

midnight, and tolled the bell for matins, while of those who obeyed the summons, some could not read, others repeated what was not in their breviaries, and many were seized with the strangest hallucinations. By injection of the extract the hen-bane becomes toxic to a higher degree, and it then affects even animals otherwise not subject to its influence.

(*Datura stramonium*). Though not a native plant in Britain, the thorn-apple is sometimes found as an "escape," in the neighbourhood of gardens. The whole plant has an unpleasant, stupefying smell, and is highly toxic: in fact, it is the most poisonous of the nightshade tribe. The action which this plant exerts on the nervous system, the delirium it causes, and the hallucinations it gives rise to, explain the effects obtained by its means by the sorcerers of the Middle Ages, and which earned for it the name of devil's apple. Another species of *Datura* "was used by the priests of Delphi to produce those semi-delirious paroxysms, which they palmed off on the

Fig. 69.—Portland Spurge (*Euphorbia Portlandica*).

multitude as the results or manifestations of divine inspiration." The plant contains, in its juice, two alkaloids, daturine (atropine) and stramoninæ.

(*Nicotiana tabacum*, *N. rustica*, etc.). Tobacco also belongs to the products of this order. It is rich in an oily alkaloid, nicotine, which is a very strong narcotic-irritant poison. One single drop, placed on the tongue of a cat, killed it in two minutes, and two drops injected into a dog speedily caused its death. In its effects on the nervous system, nicotine is directly opposed to strychnine, for whilst the latter excites the nerves up to a tetanic condition, nicotine decreases the activity of the nervous system, and it therefore proves a most efficacious remedy against tetanus. On the other hand, tobacco agrees with nux-vomica in the peculiarity of producing no effect if applied directly to the nerves. Nicotine has produced serious poisoning by being merely rubbed on the skin, and all smokers know its effects when its vapour is inhaled for the first few times. It soon, however, loses its toxic effect on the smoker (unless smoked in excess), and its peculiar, soothing, and grateful inflence only remains.

SCROPHULARINEÆ.—*Digitalis purpurea*, the foxglove, one of the handsomest of British wild plants. is also one of the most powerfully poisonous. From its leaves is prepared quite a formidable array of drugs: "Digitaletin, digitaline, digitoleic, volatile and non-volatile digitalic acids, and inosit," but of these digitaline is the most important. Deaths are on record of persons dying through drinking decoctions of its leaves, but by far the greatest number of its victims have perished through taking over-doses of the powerful medicine prepared therefrom. Substances so toxic as this should never be taken or administered without competent medical advice, and, as Professor Johnson so forcibly puts it, "it would be, indeed, about as wise to trust a child with a lighted taper in a magazine of gunpowder, as a human life to the incautious wielder of a remedy so deadly." It is also believed that digitaline has an "accumulating power" over the action of the heart, and that doses so small that at the time they will produce no unpleasant effect, may, if taken repeatedly for some time, occasion sudden death.

The THYMELÆACEÆ constitute an order of generally acrid properties. We have in England *Daphne laureola* and *mezereum*. The berries of the spurge laurel and of mezereon contain a substance named coccognin; they are highly poisonous, a few, three or four, have produced serious illness, and a larger number, if eaten, would prove fatal. Their colour, black in *laureola*, and bright red in *mezereum* makes them attractive to children, and therefore more dangerous. The bark of these and allied shrubs produces a bitter glucosid, daphnine, which renders them the most powerful of acrid poisonous plants. The mere outward application of the bark on the skin rapidly produces a deep, penetrating, and often ulcerating inflammation, whilst a strong decoction will completely destroy the mucous membrane lining the alimentary canal.

The EUPHORBIACEÆ, of which we have about sixteen species representing the genus Euphorbia, one Buxus and two Mercurialis in England, constitute a large order of some three thousand species. Many of these contain a milky juice, "latex," which is often highly toxic, though in others the poisonous principle may be dissipated by heat, and they then yield such edible substances as cassava meal and tapioca.

Euphorbia lathyris, etc. The hardened milky juice of many spurges forms the substance known as euphorbium, which is a violent irritant. This species is often cultivated for the sake of its fruit, which is pickled and eaten as a substitute for capers, hence its name—caper spurge. Real capers are the flower-buds of (*Capparis spinosa*), a scrambling bush of the south of Europe, and belonging to the quite distinct order *Capparideæ*. These true capers are quite wholesome, but the fruit of the spurge is intensely acrid when fresh, and the pickling process it undergoes probably only partly lessens its poisonous action. All our spurges are more or less toxic, and they well

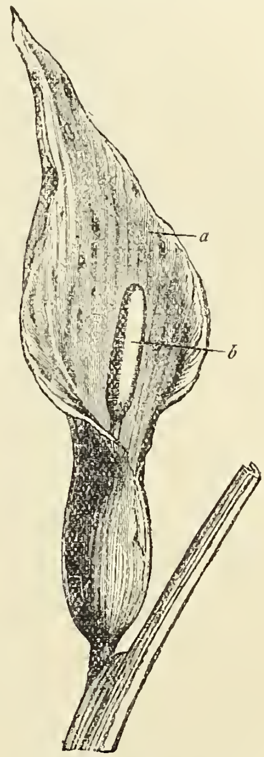

Fig. 70.—*Arum maculatum.*

deserve their German name—*Wolfsmilch.* Several cases of deaths caused by British species are on record, *E. peplis* and *E. helioscopia* being amongst them, and in all instances the alimentary canal was highly inflamed and corroded. *Euphorbia hibernisa*, so the Rev. C. A. Johns informs us, "is extensively used by the peasants of Kerry for poisoning, or rather stupefying, fish. So powerful are its effects, that a small creel, or basket, filled with the bruised plant, suffices to poison the fish for several miles down a river."

Mercurialis perennis and *annua.* The mercury contains a volatile alkaloid—mercurialine, which, at least chemically, somewhat resembles coniine. Cases have been mentioned of persons being poisoned through eating the dog's-mercury, but the annual mercury is far less powerful in its effects, and, indeed, its leaves are often boiled and eaten as a pot-herb.

The manchineel-tree (*Hippomane mancinella*), a native of tropical South America and the West Indies, may be mentioned here, it being a *poison célèbre*. The wonderful accounts of its power, for instance, that persons have died from merely sleeping beneath it, that a single drop of its juice falling upon the skin burns like fire, etc., should be subject to a considerable discount, as they are probably exaggerated.

The cassava (*Manihot utilissima*) contains prussic acid, and possibly another acrid principle of the nature of the one found in some spurges, and these render its juice highly poisonous. The roots of this plant, however, are rich in farinaceous matter, from which the cassava meal and tapioca are prepared. These roots, which weigh thirty to forty pounds, are grated; after washing, the poisonous juice is separated by pressure, and the residue is then made into thin cakes, and baked. Prussic acid and the acrid principle being volatile, the remaining poison is completely dissipated during the baking. Tapioca is a pure starch which settles in the troughs where the cassava meal is washed. It is granulated upon hot plates.

URTICEÆ.—*Urtica urens*, *pilulifera*, etc. Although our nettles can scarcely be called poisonous plants, yet no one who has ever fallen into a bed of them, and there made their close acquaintance, will be surprised to see them mentioned here. As is well-known, the leaves, etc., of the nettle are covered with numerous stiff hairs. These hairs have siliceous walls, as can be proved by heating a portion of the leaf red-hot on a mica plate or platinum wire, and their tips are bent into sharp hooks. In case of careless contact, the hairs, by means of these points, enter the skin, and being very brittle they break off, and the sap, which is strongly caustic, enters the wound and produces inflammation. The sap of the hair or "sting" of the nettle contains a volatile acid of an acrid, pungent odour, similar to acetic acid, and it is called formic acid, from having first been found in ants. As yet formic acid has been discovered in only a few plants, viz., in the leaves, bark and wood of the *Coniferæ*, in the fruits of (*Sapindus saponaria*), (*Tamarindus Indica*), the leaves of *Urtica* and *Sempervivum tectorum;* but it exists, in all likelihood, in many other plants (Dr. Wittstein). The burning pain produced by the sting of the nettle is well-known, but even that of our most virulent species, *U. pilulifera*, soon abates and disappears. Their effects, however, are not to be compared with those of some Indian species. M. Leschenault thus describes the result of touching (*Urtica crenulata*) in the botanic gardens at Calcutta:—"One of the leaves slightly touched the first three fingers of my left hand; at the time I only perceived a slight pricking, to which I paid no attention, but the pain continued to increase, and in an hour it had become intolerable; it seemed as if someone was rubbing my fingers with a hot iron, though no swelling or inflammation could be seen. The pain rapidly spread along the arm as far as the armpit. I was then seized with frequent sneezing, and with a copious running of the nose, as if I had caught a violent cold in the head; soon after I experienced a painful contraction of the back of the jaw. . . . I continued to suffer for two days, and the pain returned in full force whenever I put my hand into water. I did not finally lose it for nine days." There is another species of nettle in Timor, the effects of which are said by the natives to last for a year, or even to cause death.

I must not fail to mention the celebrated upas-tree, (*Antiaris toxicaria*), the juice of which is a violent poison, as it contains strychnine. Its effects, however, have been greatly exaggerated. "The tree is one of the largest in the forests of Java. Close to the ground the bark is, in old trees, more than an inch thick, and upon being wounded yields plentifully the milky juice from which the celebrated poison is prepared. The inhabitants do not like to approach it, as they dread the cutaneous eruption which it is known to produce when newly cut down. But except when the trunk is extensively wounded, or when it is felled, by which a large portion of the juice is disengaged, the effluvium of which, mixed with the atmosphere, affects the persons exposed to it with the symptoms just mentioned, the tree may be approached and ascended like the common trees of the forest,"—Dr. Horsfield.

CONIFEREÆ.—*Taxus baccata.* Though the dangerous properties of the yew have sometimes been denied, it is now a well-known fact that its leaves and the kernels of the fruit are highly toxic, and have often proved fatal to human beings and to cattle. The leaves contain an alkaloid—taxin, which dries in the form of a white, loose, amorphous powder, very bitter to the taste and a violent narcotic-acrid poison. Several cases are known where children have died through eating the berries, and the leaves have often caused the death of women who had taken infusions of them under mistaken ideas. The juicy red cups of the berries are harmless, but the kernels, as already stated, are highly poisonous. The savin, (*Juniperus sabina*), is also toxic, and the powder prepared from the dried tips of the branches, greatly irritates the alimentary canal, sometimes to a fatal point.

AMARYLLIDEÆ.—To this order belong the narcissus, daffodil, snowdrop, etc., and as the beauty of their flowers has made them such general favourites, many readers may be surprised that every part of these plants, especially in *N. pseudonarcissus*, (*N. poeticus*), and *N. biflorus*, is strongly emetic, and their very odour, though pleasant, is deleterious, producing intense headache, stupefaction, and even vomiting, if indulged in to excess. Their active principle is particularly strong in the bulbs.

DIOSCOREÆ.—The yam-tribe has only one representative in England, the black bryony, *Tamus communis*. Like many others of its tribe, our species has powerful acrid properties, which render it dangerous. Death, in its most painful form, is the result of an over-dose of the medicine prepared from its roots by quacks and others (Professor Johnson).

LILIACEÆ.—(*Scilla maritima*). A squill of the Mediterranean region, and sometimes cultivated in gardens, has a large bulb, from which is prepared a yellowish-white powder—scillitin, which is a virulent narcotic-acrid poison. Even in small doses it often causes torpor, coma, sometimes death. Cats, rats, and mice are particularly sensitive to its effect. The bulbs of our common bluebell or wild hyacinth, *S. nutans*, is also very acrid, and probably has a deleterious effect similar to, but by far less powerful than, that of the Mediterranean species.

Colchicum autumnale. The whole plant of our meadow-saffron contains the alkaloid colchicine, and its seeds sabadillic acid, and these render the plant toxic to a high degree. Numerous cases of death through eating its bulbs or drinking solutions of its juice are known, and at least one case is recorded of a man, who, having swallowed some of the seeds, was soon attacked with violent pain in the throat and vomiting, and death rapidly ensued. Here may be mentioned (*Veratrum album*), which grows in many places on the continent, and (*Schœnocaulon officinale*) of Mexico. The root of the one and the seeds of the other contain both veratrine and sabadillic acid, which combine to make the respective parts of these plants virulently poisonous.

The AROIDEÆ are represented in Britain by the curious cuckoo-pint or wake-robin, *Arum maculatum*, a rather common plant, six to ten inches high. The stalk, leaves, and fruit, are intensely acrid, and if they are eaten, the tongue and throat become so swollen, that death, preceded by convulsions, has often ensued. The corm also possesses these properties, and if it is crushed and rubbed on the skin it will produce a burning sensation, and even raise blisters. Like in the case of the cassava, heat will dispel the poisonous properties of the root of the arum, and by soaking these in water, then baking and reducing them to powder, a very wholesome starch is produced, known as Portland sago. Our little wake-robin gives no idea of the size attained by some aroids in the tropics. Bates thus speaks of (*Caladium arborescens*) as found on an island in the River Amazons :—"The woody stems of the plants near the bottom were eight to ten inches in diameter, and the trees were twelve to fifteen feet high ; all growing together in such a manner that there was just room for a man to walk freely between them. There was a canoe in-shore, with a man and a woman : the man, who was hooting with all his might, told us in passing that his son was lost in the 'aningal' (arum grove). He had strayed whilst walking ashore, and the father had now been an hour waiting for him in vain." Whilst F. W. Burbidge tells us that (*Amorphophallus campanulatus*), which he saw growing near Singapore, "is of Titanic dimensions, producing a lurid spathe, nearly two feet in circumference, and exhaling the most fetid and repulsive of odours." Another exotic member of this group, from the West Indies, grows to a height of five to six feet, and its juice is so extremely acrid, that when touched by the tongue it occasions excruciating pain, accompanied by an intense inflammation of the tongue which prevents speech. Hence it is called dumb-cane.

GRAMINEÆ.—The grass tribe gives us but one deleterious species, and this is the darnel, *Lolium temulentum*. The flower ground from its seed is grey, has an unpleasant smell, and when boiled in water it causes a strong effervescence, and produces a stupefying odour. When kneaded with water it makes a bad dough, which does not rise properly. The bread baked from it is black, and has a bitter, unpleasant taste. The darnel is a narcotic-acrid poison, and its effect generally resembles that of intoxication by alcohol. "The first intoxicating effect is usually succeeded by dizziness and loss of sight, often followed by delirium. In some cases paralysis and gangrene of the limbs have followed the continued use of bread containing darnel" (Professor Johnson). And one case is on record of a man who was killed by persisting to eat bread made from flour containing one part of darnel to five of wheat.

We have now passed in review, besides a few foreign species, the most important poisonous plants of our endemic Phanerogamic Flora. But we have many others which possess more or less acrid properties, or possibly contain other poisons, but in such small quantity that they have not proved dangerous to man. Amongst these we may mention the wood-sorrel, *Oxalis acetosella ;* wall-pepper or biting stone-crop, *Sedum acre ;* sundew, *Drosera rotundifolia ;* elder, *Sambucus nigra ;* leopard's-bane, *Doronicum pardalianches ;* acrid lobelia, *L. urens ;* hound's-tongue, *Cynoglossum officinale ;* yellow toad-flax, *Linaria vulgaris ;* box, *Buxus sempervirens ;* sorrel, *Rumex acetosa ;* fœtid iris, *I. fœtidissima ;* flag, *I. pseudacorus ;* herb Paris, *P. quadrifolia*, etc.

No list of poisonous plants would, however, be at all complete that did not, at least, mention those remarkable cryptogams, the FUNGI—mushrooms or toadstools—for whilst many species are highly nutritious, many more are virulent poisons. Their action is generally acrid or narcotic, but sometimes their poison is said to resemble arsenic in its effects, and in one case the symptoms were like those of the Asiatic cholera. Mr. Worthington G. Smith, one of our leading fungologists and an enthusiastic fungus-eater, tells us he invariably tastes every toadstool new to him, and has notes to this effect on all the species he has selected: "In some species the effect is very peculiar, sometimes (as in *Agaricus mellens*) it causes a cold sensation at the back of the ears, and swelling of the throat; at others (as in *Marasmius caulicinalis*), the taste proves to be intensely bitter; some are so fiery (as in *Lactarius turpis*, *blennius*, and *acris*), that the smallest piece placed upon the tongue resembles the contact of a *red-hot* poker." Their odour he also found to differ: "many are very pleasant, like meal; a few are sweet; some resemble stinking fish (as *Agaricus cucumis*); one, mice (as *A. incanus*); another, camphor; whilst *Marasmius fœtidus*, and *impudicus* are like putrid carrion; others are like burnt flannel, garlic, rotten beans, and almost every imaginable disagreeable thing (W. G. Smith in "SCIENCE GOSSIP").

Unfortunately there is no "golden rule" for the discrimination of the edible and noxious species, and a long study, often of purely microscopical details, is required before this can be done with safety. The odour, taste, and general appearance are, however, the most reliable guides Nature has given us in these and other toxic plants. And, roughly speaking, we might say that *edible* mushrooms generally have a white, creamy or buff colour; the gills are white or pink, and the stem white or grey; their taste is mild or sweet, and their odour agreeable; their white juice does not readily change colour when exposed to the air, and their flesh is firm. On the other hand, most fungi that are red, scarlet, green or black on the top, those having yellow, red or brownish gills, and a stem of similar colour or perhaps spotted; all those that have an acrid or burning taste, and an unpleasant smell; and those that turn blue or red when broken; that freely secrete a milky fluid, feel slimy and generally flabby—should be avoided as probably *dangerous*. Amongst the most common of our poisonous species we find: *Agaricus vernus*, *Phalloides*, *muscarius*, *sinuatus*, *crustuliniformis*, *piperatus*; *Lactarius pyrogalus*, *acris*, *rufus*; *Russula emetica*, *Marasmia urens*, and *Phallus impudicus*.*

We have now thrown a rapid glance through one of the most interesting pages in the wondrous book of nature. In spite of our, necessarily, somewhat hasty review, we have found, even in the limited area of our British Flora, a formidable array of plants noxious to animal life in a high degree. These unexpected results naturally lead us to enquire: What is the cause of poisons in plants, and how were they produced? Only one logical answer can be given: They were evolved through the struggle for existence, which, selecting those variations *most useful* to the plant, gave the most poisonous individuals a better chance to live!

Poisonous plants do not form a single and isolated group; they are, as we have seen, scattered here and there amongst the different orders, nearly every order containing, in some part or other of the world, some poisonous species. We have, likewise, seen that all these plants do not produce the same poisons, although generally all species of an order, or at least of a genus, possess similar properties. We cannot have helped observing that we seldom find two or more poisons, in different plants, of the same nature or intensity, whilst, on the other hand, we can easily trace a perfect series where the toxic properties range from a slight acidity of the sap (as in *Rumex oxalis*, etc.) to a copious and highly virulent special secretion. These secretions, again, may be found either all over the plant, or they may be produced in particular, often very limited organs, as in many seeds (notably the "ordeal beans" of *Physostigma*), in barks, roots, the "stings" of *Urtica*, etc. From this follows that whilst in some plants every part is toxic, in others some parts are not only harmless but indeed highly nutritious (e.g. the potato). And, finally, let me remark that few plants are equally noxious at all periods of their life, as many only reach their highest point of virulence at the time of flowering. I have laid so much stress on this *tendency to vary* because it is *this* that has enabled natural selection to preserve the most poisonous plants of any given group, and thus to give rise to more highly toxic varieties and species.

Plants form the natural food of animals, and are continually destroyed in incredible numbers by multitudes of snails, insects, birds and mammals. It is evident that any species possessing no defences (or one the defences of which had ceased to be adequate to new requirements) would soon be exterminated—as many doubtless have been. Mechanical defences such as thorns, spines and hairs, though forming a good protection against some of their foes, are soon overcome by others, and it is plain that no plant could be better protected, than by having properties noxious, or at least distasteful, to most animals preying on it. Now, any animal coming to feed on a bed of growing plants, such as we often see in the spring, would naturally select for food those most agreeable to the taste, or, if all happened to be seedlings of a poisonous species, it would eat the least loathsome. In this way, the animal would unconsciously favour the most virulent plants, not alone by letting them grow on, but also by clearing the ground of species or individuals that would have competed for moisture, soil, air, and light. They would then grow strong, perfect, and produee healthy seed inheriting their toxic, but for the plants useful properties. We have only to allow sufficient time for this unconscious (*i.e.* natural) selection, of the most virulent from the most poisonous, in different places and by various animals, and in the course of time, may be of ages, we should find numerous plants, all producing poisons, but differing in nature and intensity in all degrees. And this is actually the case!

* For further information see "Mushrooms and Toadstools," by Worthington G. Smith (Allen & Co.), with two sheets containing altogether sixty excellent coloured figures of edible and poisonous fungi.

Whether some poisonous products (some of the alkaloids, for instance), have now come to be of other uses in the economy of the respective plants, we do not know. We cannot, however, doubt that most of these properties, except perhaps when *very* slight, have been developed through the influence exerted on the vegetable world by the animal kingdom since they first came into close contact. The poisons of plants must therefore be regarded as purely defensive weapons, and the peculiar nauseous odour, the dark, lurid, ugly colours and generally repellent appearance of most poisonous plants, warn all animals of their dangerous nature.

CAN DOGS TALK?

By W. C. Flood.

IT has been calculated, we believe, that for the requirements of his everyday conversation, the vocabulary of a well-educated man contains about five thousand words, although one of exceptional genius might employ three times that number, whereas an ordinary person makes use of not more than two or three thousand words, and an uneducated agricultural labourer is possibly content with a few hundreds. The language of some savages is even more meagre in its vocabulary, in fact, with certain tribes language resolves itself almost into its simplest form, and conversation cannot well be carried on in the dark, because signs and gesticulations are with them almost as important as speech itself.

Bearing in mind that such scanty and imperfect language suffices for the requirements of some men, one would possibly not be too presumptuous in crediting many of the lower animals with the power of speech in a simple or rudimentary form. In fact most of us have pet animals of some kind, and by constant association with them we learn to understand with more or less accuracy, the means which they adopt to express their wishes. Most particularly, perhaps, is this the case with dogs, for these animals are the ordinary pets and companions of man, and they have, moreover, the power of emitting a great diversity of distinct and easily distinguishable sounds.

So far as taking part in a discussion, or even carrying on a simple conversation, a dog cannot talk. In fact, it may be safely asserted that man alone enjoys the gift of speech in the ordinary acceptance of the word. But if we recognise as language the power of expressing certain desires and emotions by means of well-defined and easily-distinguishable sounds, then the dog has as much right to be credited with the power of speech as man himself.

The language of a dog, if it may be dignified by such a name, is of course, language in its simplest form—simpler, in fact, than that of even the most primitive savage race with which man is acquainted at the present day. There appears to be in the canine tongue no separate words for food, drink, or anything else which a dog may want. The latter simply intimates that it wants something, and as a rule it is only the attendant circumstances which enable us to understand what may be required. A whine is frequently, but not always, used for this purpose. When barking is resorted to, the barks are usually single ones. Sometimes, too, a short growl is used.

Primarily we may place most of the sounds which a dog usually makes under the following six headings:—Whine, howl, growl, bark, yelp, and the squeak or squeal. Some of these, as the bark, may be subdivided into several distinct varieties, and when we also take into consideration the difference caused by intonation, we find that this number is still further increased.

The tone in which a dog barks or growls is not less important than the bark itself; but it is by no means so easy for an inexperienced ear to distinguish all the varieties of expression.

The bark of a dog appears to be generally looked upon as the characteristic noise which this animal makes. Probably the most frequent, it is certainly the most noticeable, and is capable of greater variation than either of the other sounds we have named. Thus among the different kinds of barking we may mention as being the most easily distinguished, are two which for convenience we will name the bark of interrogation, and the bark of warning. The former is a single bark, sometimes preceded by and joined to a kind of growl. It is used when the dog hears, or fancies it hears, some unusual sound, and evidently means "What is that?" or "Who is there?" and may be regarded as an equivalent to the challenge of a sentry on duty. Should a dog have no doubt in its mind, however, that something is wrong, as, for instance, when the footsteps of a stranger are heard on the premises, it will give utterance to what we have styled the bark of warning, which consists of several "bow-wow-wows," delivered furiously in rapid succession.

Whether the dog addresses itself to its master or to the person at whom it barks is not quite clear, but probably the intention is, while acquainting the former with the fact that something is wrong, at the same time to inform the latter that his presence is known, and that if he misbehaves himself, or possibly, if he does not beat a retreat without loss of time, he may have to answer for some very unpleasant consequences. Frequently, when one dog hears another barking in this particular way, it will raise its own voice in a similar manner, even though it cannot see or hear the cause of the disturbance.

A form of barking somewhat similar to the foregoing, but nevertheless easily distinguishable from it by the practised ear, or indeed, by most people who have paid much attention to dogs, is the noise made by one when it is pleased, or when it is welcoming its master.

The sound commonly called whining is usually made by dogs when they are in some trouble. In certain cases it might perhaps be taken as an equivalent for crying or sobbing; but it may generally be regarded as an appeal for help. Thus a dog that is shut up, or chained up, will whine to be released. Frequently, too, a dog will whine when something that it wants is out of its reach, although, as we have already said, a bark is often used at such a time.

The "yelp" is a shrill kind of bark, or what one might term a cross between bark and whine. It is often used in conjunction with, or instead of, the latter; but it probably indicates a greater amount of excitement or anxiety, the degree of excitement regulating to a great extent the rapidity of the yelping. For instance, when a dog is excitedly chasing a cat or a rat under circumstances which make it fear that it may lose its prey, it will give vent to a rapid succession of yelps, whereas, when appealing for its release from captivity, the yelping is usually slow, the cries, separated by more or less prolonged intervals, being quite distinct from each other.

The majority of people are apt to look upon growling as a sign of ill-temper; but in reality dogs make two distinct sounds, which, although somewhat similar, are nevertheless of very different import. One, it is true, indicates rage, or growing anger, and is the growl which precedes a bite. It is a low note with a good deal of vibration. The other growl is generally in a somewhat higher key, with a more or less pronounced nasal sound, and is indicative, not of surliness, but of good temper, for it is used only when the animal is at play.

The "squeak" or "squeal" is never used except when the dog is subjected to sudden fear or pain, and is probably an involuntary sound, synonymous with the human scream—a cry common, no doubt, to all mankind—which, uttered under like circumstances, is equally involuntary.

We have not classified the easily recognisable cry uttered by dogs while they are fighting. It is, in fact, a mixture of barking, yelping, growling, and squeaking, doubtless an involuntary venting of the passionate emotions that might possibly be regarded as a canine counterpart of the profane swearing occasionally indulged in by man himself when similarly engaged.

From the foregoing examples—which, by the way, are only a few of those that might be given—the reader will easily understand that a dog is capable of giving utterance to a far greater variety of sounds than are comprised in the conventional bark. It will be seen, too, that the canine language, if it can be so called, is one in which sounds that are practically almost identical may not always convey the same meaning, while on the other hand several different cries may be used for the same purpose. It will be found, however, on careful observation, that the tone of a dog's voice is in a great measure the key to the meaning which that animal wishes to convey by the sounds to which it gives utterance, the latter being in many cases adapted to circumstances, at times, in fact, being employed somewhat as one might regulate the use of certain words for the purpose of giving more or less force to an expression.

In studying the significance of the sounds that dogs are capable of making, it is not always easy for us to tell how far those sounds have been the result of intentional or accidental training. The language of man himself may be regarded as an acquirement rather than a natural gift, and possibly the only sounds which may be considered natural to him would be common to the human race generally, and expressive of such simple emotions as pleasure, anger, fear, or pain. Similarly, certain sounds emitted by a dog may be considered as artificially acquired, and capable of more or less cultivation, though in a much less degree than is the case with man. Thus, it is said, that wild dogs never bark; but that barking has been acquired in the domesticated state, as though it were an attempt on the part or our canine friends to hold intercourse with us and make themselves to some extent understood. A dog can easily be trained to bark on particular occasions, and in a particular way; and it will, moreover, evidently be well aware what such barking is for, and the results that are likely to follow. Thus we may without difficulty teach a dog to bark for its food, and evidently knowing well the reward it will probably get for so doing, it generally barks when it sees anything edible that it may take a fancy to.

How far this process of linguistic cultivation can be carried, and to what extent it can be transmitted to subsequent generations in the case of dogs, we are not prepared to say. With man himself it would seem to be practically unlimited, and it is probably not impossible that some patient and persevering individual may eventually succeed in producing remarkable developments in "dog talk," even though the latter may fall far short of the ordinary conception of language.

SPIDERS' WEBS FROM SIERRA LEONE.

In the woods of the Sierra Leone peninsula—there and throughout West Africa called "bush," in contradistinction to the term "jungle," used in the East Indies—I noticed webs built by two species of spiders, photographs of which I enclose, and a short description of which may be of interest to some of your readers.

Fig. 72 represents the centre of a web, the general construction of which is similar to that of our home garden-spider, *Epeira diadema*. This centre is woven more closely, and very effectually conceals the spider from view. Immediately surrounding it is a ring of such open texture as to allow the occupant to pass easily aud rapidly from one side to the other.

This particular web was built between branches of a lauraceous shrub growing near water, a place through the open meshes of the central part, and ran towards the entangled fly. I captured both in a chip-box, and secured the centre of the web by cutting it out between the lid and body of a glass-topped box. With legs expanded the spider covers an area of a little over an inch in diameter. The

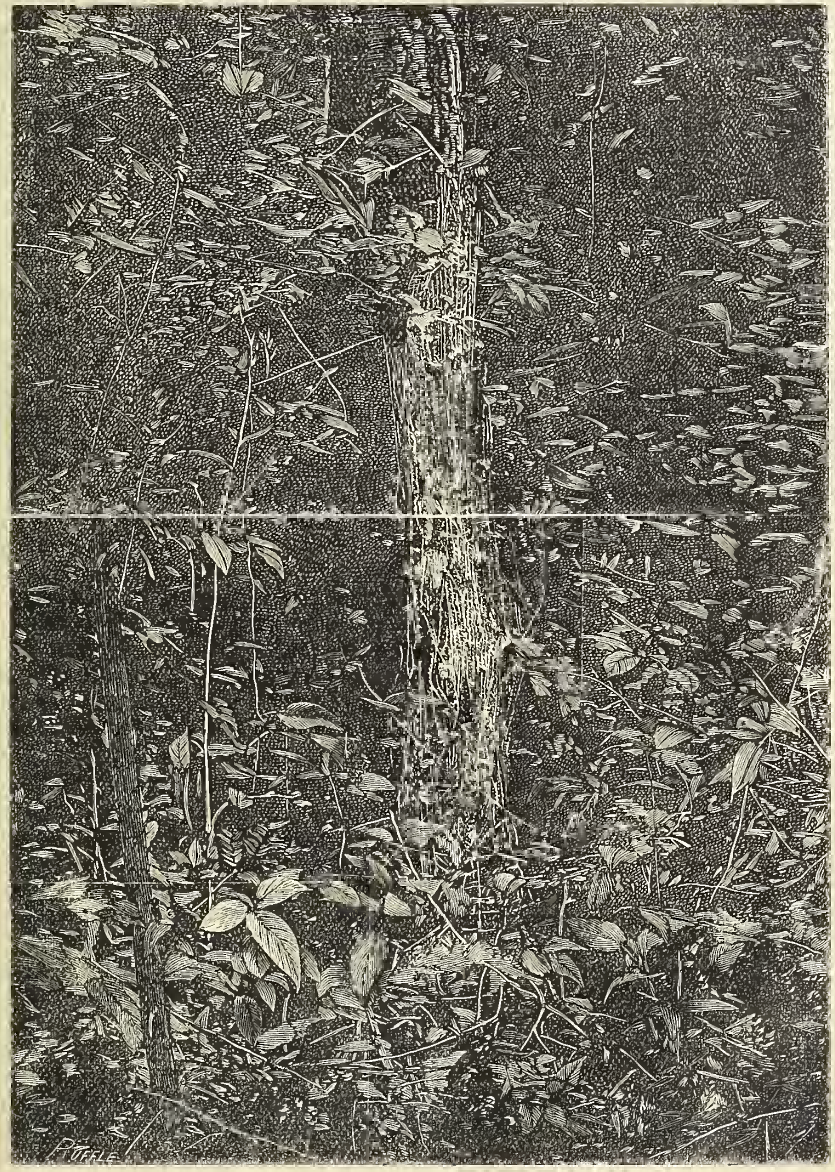

Fig. 71.

requented by two species of stalk-eyed flies, *Diopsinæ*, examples of which I was in quest of. I had noticed the web and its central opacity, but I did not perceive the spider, until a Diopsis flew into the meshes, from the side on which I was; simultaneously the spider appeared from the opposite side, coming cephalo-thorax is circular, flattened from above downwards, this and the abdomen being covered with short, silvery-grey hairs. Legs alternately banded yellow and black, furnished with black hairs and spines. Eyes eight, two on the top of the head, two on the anterior edge, and two pairs arranged laterally on the inferior aspect. Its range of vision must therefore be very extensive, and its coating of grey hairs would render it the more indistinguishable.

To Mr. Pocock of the British Museum, to whom I submitted these spiders, I am indebted for its identification as *Argiope aurelia*, Walckenaer. It belongs to the same family as our own garden-spider. Its web, however, does not appear to have been before described.

Fig. 71 is from a photograph of a web which had a

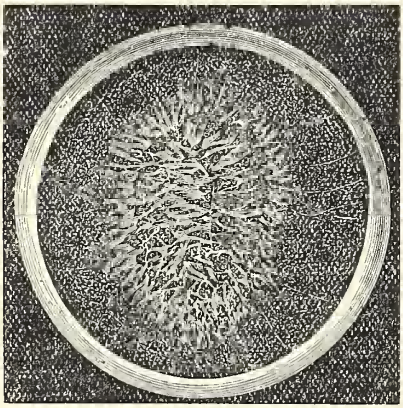

Fig. 72.

height of between six and seven feet. There were some half-dozen of them built in a partially cleared space in the forest. A ray of sunlight falling upon it, gave it a beautifully glistening appearance. This was the largest, and having cleared sufficient room for my camera, I photographed it. The bottom part of the web is in the form of an inverted widely-spread funnel, the top being truncated, leaving a circular aperture of three-quarters of an inch in diameter. The spider lived beneath the cone, and gained access to the upper portions of his snare by the hole in its top. Numerous threads arose from the funnel and were attached to an overhanging branch, more than six feet above. The spider has eight eyes, arranged in the form of the letter X, on the top of the head. Expansion of legs, one-and-a-half inches. General surface of body smooth, and in colour of varying shades of brown. Sides of abdomen white speckled with black. Thorax with medium dorsal, and two lateral white streaks.

Mr. Pocock was unable to name it, but judged it to be nearly related to the genus *Ocyale*, a group of hunting-spiders, of which the common *Lycosa* is a good British example.

W. G. Clements.

We are glad to welcome a new periodical, entitled "The Sussex and Hants Naturalist." Mr. Harcourt Bath is as usual to the fore on his favourite topic, the dragon-flies, and other papers appear by H. Durrant, Albert Waters, etc.

SCIENCE-GOSSIP.

"Those who live longest, can laugh loudest," says an oft-quoted, brutal proverb. Alas! the opposite is the truth. One's oldest and dearest friends, whose friendship has grown into half a man's individuality and happiness, die off. It is an exfoliation of personal life. Such is the case with the death of Mr. T. G. Bayfield, of Norwich, and the editor of this magazine. A close, intimate, delightful friendship of thirty years has been sundered. Mr. Bayfield was one of the best all-round men in East Anglia—archæologist, linguist, botanist, geologist, etc.—and the most unassuming, modest, and humorous of men. His death is a decided loss to scientific Norwich.

On March 8, a conversazione took place in the large hall of the Bow and Bromley Institute, to commemorate the twenty-second year's existence of the above-named society. There were thirty microscopes on the tables. Whilst the members and friends were examining the objects exhibited, the ear was delighted by an excellent organ recital by Mr. Gilbert W. Tozer, pupil assistant St. Peter's, Eaton Square. At nine o'clock photo-micrographs were projected through the magic lantern on a twenty foot screen, and from ten o'clock, the remainder of the evening was devoted to dancing. If the number present was a guide it was evidently much appreciated.

From time to time we hear of terrible storms or atmospherical disturbances, from which, happily, the British Islands are fairly free. They generally visit large continental or oceanic areas. Only a week or so ago, our daily newspapers recorded the occurrence of another fatal and destructive visitation of a cyclone or tornado in North America. Sometimes these storms have been seen to descend directly from the upper parts of the atmosphere to the earth, and to re-ascend three or four times during their progress of less than twenty miles, The chief authority on this subject is M. Faye, who has contributed various papers upon it to the Paris Academy of Sciences. According to his well-worked-out theory, cyclones, tornadoes, and waterspouts have their origin, not in hot convection currents from the soil, but in disturbances of the upper strata of the atmosphere. He explains the observed cases of upward suction of heavy objects as the effects of the reflection of downward currents of the soil.

Professor Oliver, the other day, laid before the Scientific Committee of the Royal Horticultural Society, the result of some very important experiments and observations, which of course apply equally well to all towns and cities where fogs are apt to prevail. We are now perfectly aware that fogs and clouds are practically the same. One descends to the earth under special local conditions, the other remains suspended in the atmosphere. But there could be neither clouds nor fogs without dust, around every floating particle of which the moisture condenses. Hence in cities like London, where there is such a vast quantity of coal-dust in the shape of smoke, daily poured into the atmosphere, it cannot be wondered at that fogs should accumulate and abound, especially during those periods of still weather, termed "anti-cyclonic," when the bulk of the atmosphere is stationary. Professor Oliver shows that the waste products thrown into the air produce different effects upon the leaves and flowers of plants. Phenol turns them black. Sulphurous acid, so prevaleut in fogs, kills white flowers at once. In short, the different ingredients in city fogs appear to have each its own destructive method of attack. Thick-leaved plants, such as holly and aucuba, even even when covered with deposit of fog, remain healthy on account of the thickness of the leaves, which contain two or three rows of cells, instead of one layer only, as in other plants.

MOST of our readers are aware that if they purchase a number of pill-boxes for any purpose they are "nested" one inside the other. How little do we know of life, or of the messmateship of living organism? For instance, in the last number of the "Journal of the Royal Microscopical Society" there is an elaborate paper by Mr. C. H. Gill, giving the natural history of a parasite on diatoms. Diatoms are prettily-shaped, prettily-marked, single-celled plants, with a silicious or glassy skin. In this instance the host plant is only the three-hundredth part of an inch in length, but, minute though it be, it has a parasite all to itself, of course infinitely smaller, and Mr. Gill has carefully worked out its life-history in his paper, which is illustrated by nine photographs, showing the different stages of the parasite's development.

AT the last meeting of the Royal Society Professor Dewar stated he had succeeding in freezing the atmosphere into a clear, transparent solid, although at present it has not been sufficiently proved whether the mass was a jelly of solid nitrogen containing liquid oxygen, or a true ice of liquid air into which both these well-known gases have been equally solidified.

PROFESSOR GEORGE HENSLOW recently delivered a lecture at the Royal Horticultural Society on the subject, not only of cultivating flowers, but of germinating seeds under coloured glass. This is a most important matter just now, for in a few years many of the Channel Islands will be half covered with glass, to say nothing of the warmer parts of southern and south-eastern parts of England. It is beneath these extensive glass-houses and frames the enormous quantities of early vegetable delicacies that we enjoy —asparagus, sea-kale, early peas, new potatoes, strawberries, to say nothing of tomatoes, flowers, etc. —are grown. What is the best tint of glass under which forced plants can be grown? Thus, lilies of the valley seem to gain by a fortnight when grown in a violet-glazed house. Green glass seems to be the worst of all. For the germination of seeds total darkness is the best, and for all green-foliaged plants free light and air are to be preferred.

PROFESSOR CROOKSHANK recently gave a lecture on "Bacteria" (the microscopical funguses we have hitherto regarded as only baleful, but which are actually amongst mankind's best friends). One great group produces fermentation, so that without them we should have neither wine nor beer. Another division is the cause of organic decomposition, amongst which must be reckoned the nitrifying bacteria of the soils. If it were not for the latter group every animal that died would be as indestructible as an Egyptian mummy, inasmuch as the art of "mummifying" consisted in keeping away the decomposing bacteria. If it were not for the latter the surface of the earth would be piled with dead bodies, stacked in heaps or choking the rivers; not only that, but in time all the elements capable of building up living bodies would be used up—locked up in these corpses—and life would cease for lack of material to support it. The greatest enemies to this class of bacteria are the undertakers!

JUPITER is thirteen hundred times larger than the earth, so we take a great deal of interest in it, and its careful study of recent years has thrown a great deal of light upon the history and manufacture of worlds. One of the keenest astronomers, who was taking special charge of this huge globe, is Prof. Pickering, the distinguished American scientist. In order to study the planet more definitely he has been residing on the top of Arequipa, in Peru, on account of its clear and cloudless atmosphere. He writes from there to state that the surface of Jupiter seems to consist of a uniform white mass of cloud, over which is stretched a gauzy and thin veil of brown material. The well-known belts of Jupiter, he says, are simply dense masses of this thin brown material, and the white spots merely holes seen through it. The most remarkable thing about Prof. Pickering's observations concerns the moons or satellites of the planet. He has arrived at the conclusion that Jupiter's four moons are not solid, like ours, but merely condensed masses of meteorites, like those which compose the belts of Saturn.

THERE is a glamour about the beginnings of life, geological as well as biological, which attracts scientists in the same manner as the speculations of theologians concerning the life to come. For example, a distinguished German physiologist, Prof.

Butchli, has announced his discovery of artificial protoplasm. A person who can manufacture that substance is not far from manufacturing rump steaks, or men and women.

At the last meeting of the Royal Microscopical Society, Dr. Dallinger showed that he could not suppose that any one looking at these foams would regard them as in any way allied to living matter. The more intimately they became acquainted with them the more sure they would become that they were only foams, and that those which appeared under a low power to be so much like tissue were under a high power seen to be minute bubbles, and nothing more. He believed the movements observed would be found to be due to the effect of differences of surface tension, and that the study of them would no doubt help them to understand some of the mechanical properties of protoplasm, but they did not leave an impression that they had caused an approximation in the least degree towards the artificial production of protoplasm.

In a recent number of the "Idler" we were introduced by Mr. Jerome to the idea of an electrically-contrived automatic dancer, and the account of its performance is therein detailed with a precision that is almost scientific. Automatism is becoming every day more popular and more important. Mr. Jerome's idea is not novel, for something approaching it (with infinitely drier humour) occurs in Mr. Samuel Butler's "Erewhon" one of the most original books of this century. But the "Idler's" idea of on electrical automatic dancer has just come up to my mind on seeing the announcement of a newly-invented electrical piano, which plays by itself. You have only to put the music in an opening at the back (a penny-in-the-slot business), perforated as usual, and turn on the current and be gratified.

The April number of "Nature Notes" is replete with sport, interesting articles by such well-known lovers of nature as Hamilton Dove, F.Z.S., Ernest Ingersole, and J. J. Platel, B.A. Mr. E. H. Hickey is quite at home in his short criticisms of Roden Noel's poetry, and the notices of new books are very much more carefully and accurately written than the majority of such articles in contemporaries.

The last issue of the "Midland Naturalist" contains "A Trip to Egypt," by W. H. Wilkinson, with detailed accounts of the Pyramids and Sphinx. "The Devonian Rocks of Ilfracombe and Barnstaple," by the Rev. W. Hunt Painter, reports of societies, reviews, etc. etc.

"Natural Science" for April is full of useful and original matter such as "The Mammals of Kilima-njaro," by the secretary of the Zoological Society, Mr. Sclater; "Colour Changes in Insects," by George Carpenter; and "Experimental Embryology," by J. A. Thomas F.Z.S.; together with "Notes and Comments," "New Books," "Obituary," etc. etc.

In "Feuille des Jeunes Naturalistes" for April will be found a capital paper by M. Dupont, on "The Geological Distribution of the Genus *Colias*," which will be read with interest just now, when every entomologist thinks he knows all about this particular group of butterflies. Several of the "Special and Local Notes" are very original, notably Lamarlière's "Flora of the North, and the Straits of Dover."

MICROSCOPY.

M. Tempère's Publications.—We have received No. 12 of "Le Diatomiste," perhaps the best of the lot, which now completes the first volume. Diatoms have been "looking up" since M. Tempère took them in hand. The beautiful micro-photos of them (four quarto plates) in the present number can hardly fail to appeal to æsthetic tastes. No. 2 of "Le Micrographe Préparateur," edited also by M. Tempère, with the assistance of a group of specialists, throws a larger cast-net. "Vine Disease" is a specially good paper. The coloured plates are excellent.

ZOOLOGY.

Hydrometra gibbifera.—On the 3rd of last March, while out for a ramble, I came across a double row of tiles in a brick-field, which, to my mind, is always a grand hunting-ground for the coleopterist. Between two of these tiles I found a specimen of *H. gibbifera* (the water-gnat), evidently hibernating, as there was water about six yards away. It was in a position quite unlike that set forth by the Rev. Theodore Wood in "Our Insect Allies," as instead of having the two posterior pairs of legs stretched out almost at full length (as figured), they were bent and drawn quite close around the body. It was in no cocoon, and, when warmed, quite lively. I take it to be a female, as it is very much larger than any other specimens of the same species in my cabinet, and is slightly red on the under side, possibly from its contact with the tiles. I may mention, in conclusion, as an illustration of the fertility of such a hunting-ground, that on the same day (March 3rd) from forty tiles I also took six specimens of lepidoptera, three different species; fourteen specimens of coleoptera, six different species; several other heteroptera, arachnidæ, etc., etc., truly a "happy family!" There are hundreds of gibbifera on the adjoining pond now (April 11th).—*Claude Morley, The Museum, Ipswich.*

This month's "Naturalist" contains, among other articles, a first-class paper by J. Cordeaux, M.B.O.U., on the appearance of the "American White-throated Sparrow in Holderness." We are glad to see that the rare beetle, *Cychrus rostratus*, has occurred near Ulverston, recorded by Lister Petty. The "Bibliography" referred to in our last month's notice still continues.

"I have never seen, nor do I remember to have heard of, a Norfolk pike weighing more than 36 lbs., and all the very large fish have been females. An experienced angler and fish-preserver tells me he never met with a male fish weighing more than 20 lbs. The roe of a large pike will weigh as much as 6 lbs. Some wonderful stories are on record of big pike. Day mentions on various authorities 170 lbs. and 146 lbs.; and Daniel in his "Rural Sports" refers to one from Loch Ken, Kirkcudbrightshire, which measured upwards of 7 feet long, and weighed 72 lbs.; another from the same locality is said to have weighed 61 lbs., and yet another from County Clare scaled 78 lbs. Mr. Pennell mentions on apparently good authority some very large continental pike; but all these sink into insignificance when compared with the famous Kaiserwag Lake pike, the story of which has so often been told. When captured it was found to be ornamented by a ring, the Greek inscription on which stated that it was placed in the water by Frederick II. in October, 1230, only to be captured 267 years after, having at that good old age attained to a length of 19 feet and a weight of 550 lbs. Was not the skeleton to be seen in Mannheim Cathedral in proof of the legend? But, sad to say, a wicked German anatomist discovered that the vertebræ of several fish had to be used to make up the required length! Truly, there must have been giants in those days."—*Thomas Southwell, in the "Gentleman's Magazine" for May.*

In Science-Gossip, 1893, p. 27, No. 38, for Roberts' *palustriformis*, read Kobelt's *palustriformis*.

BOTANY.

Papaver dubium, L.—In Kent, among others, I found a specimen of this plant late in July, growing with *P. Rhœas*, L. and *P. somniferum*, L. (naturalised in this country) in a cornfield. On the plant of *P. dubium* there was a matured capsule, which had on all the cells numerous setæ; the capsule I have preserved in spirits.—*H. E. Griset.*

"Contributions from the Botanical Laboratory of the University of Pennsylvania."—This is the first number of the first volume of "Botanical Papers," containing seven original papers by six contributors. It is an admirably got-up *brochure* in every respect—paper, printing, and illustrations (thirteen plates), and we cordially commend the work to the notice of botanists.

Nectaries.—M.D., of Hawkshead, in his article on "Nectaries" (p. 61), whilst mentioning that the humble-bees are the proper guests of the snapdragon, does not notice a fact which may be of interest to your botanical readers, viz., that small bees, though unable to force their way through the firmly-closed lips of the flower, yet by biting a hole through the petals at the base can (and do) obtain the nectar inside. The long tubes of the flowers of our hothouse plumbago can be fathomed, I suppose, by no English insects; yet bees, when they are up to the dodge of boring just at the top of the calyx, find them very attractive. I believe there are several other flowers subject to such plundering raids.—*H. St. A. Alder.*

To Botanists of Europe and North America.—The Rev. Arthur C. Waghorne has collections of plants, and would be glad to dispose of some of his material. His plants have been named. Dr. Warnstorf is now determining his sphagna, and in a few months he hopes to have about twenty-five species and varieties of Labrador and about thirty-five of Newfoundland sphagna to distribute. In some cases he would exchange. He would willingly afford any information in his power on the flora of Newfoundland and the Labrador. He would be glad to hear of botanists who would kindly determine some of his mosses, hepaticæ, and lichens. He has also a few fungi awaiting determination. He would gladly forward specimens of any particular genera to specialists.—*The Parsonage, New Harbour, Newfoundland.*

GEOLOGY.

A Mammalian Incisor from the Wealden of Hastings.—At the last meeting of the Geological Society a paper was read by Mr. R. Lydekker, In it he described a small rodent-like tooth from the Wealden of Hastings, belonging to Sir John Evans, K.C.B. It is probably the front tooth of one of the mammalian genera found in the Purbeck beds, as may be gathered from American specimens. In the discussion which followed, Sir John Evans gave some details as to the discovery of the specimen and its subsequent history. He found it at Hastings, in a block of Tilgate grit, which formed part of a heap by the side of the sea-shore, and almost immediately afterwards gave it to Professor Prestwich, in whose collection it was mislaid for a period of over thirty years. On again coming across it, Professor Prestwich placed it at the speaker's disposal, who now presented it to the national collection. The finder had all along regarded the tooth as an incisor, not improbably of a rodent, and was glad to find his attribution now confirmed.

NOTES AND QUERIES.

SPIDERS' THREADS.—About a month ago I walked across two fields, the one pasture and the other recently ploughed, which were completely and thickly covered with spiders' threads. At first sight they all seemed to run in the same direction, viz., at right angles to the line between the observer and the sun (where only they were visible), but examination proved that there were others running in other directions. I should be glad if you would tell me the cause of such a multitude of threads, and where all the spiders could have come from. The fields were between one and two miles apart. I did not notice the spiders' threads on any other field.—*Frank Sich, jun., Street, Dartmouth.*

MIGRATORY LOCUSTS.—Can any readers of SCIENCE-GOSSIP inform me if they know of the occurrence of any species of migratory locusts in the British Isles within the last ten years or so.—*W. Harcourt Bath*, 195, *Ladywood Road, Birmingham.*

THE STRUCTURE OF SEEDS.—There is a difficulty of a practical nature which meets those who have not advanced very far in botanical studies, viz., the examination of the contents of minute seeds, so as to ascertain the position of the radicle, with regard to the cotyledons, etc., as indicative of the genera to which a plant belongs. I believe an article in SCIENCE-GOSSIP on this subject would be a great boon to many amateurs, giving in some little detail, the best methods to adopt according to the size and nature of the seed.—*F. Burkell.*

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

EXCHANGES.

WANTED, the following British beetles: *Gnorimus variabilis, G. nobilis, Trichius fasciatus, T. abdominalis, Cetonia aurata, C. floricola, C. stictica, Anomalia Frischii, A. Donovani, Phyllopertha horticola, Polyphylla fullo, Melolontha hipposcastani, Rhizotrogus solstitialis, R. ochraceus, Serica brunnea, Homaloplia ruricola, Hoplia philanthus, Copris lunaris, Dorcas parallelopipedus, Sinodendron cylindricum*, and other Lamellicorns; also British mole crickets, field-crickets, locusts, and dragon-flies. Offered, foreign and British lepidoptera, British dragon-flies, marine shells, land and freshwater shells, echinoderms, and natural history books.—W. Harcourt Bath, 195 Ladywood Road, Birmingham.

OFFERED, *Bulimus oblongus, B. glaber, B. vincentinus*, and eggs of *B. oblongus* from Trinidad; *Bulimus insignis, B. histrio, Helix sinistrorsa, Pythia chalcastoma*, and variety from Lifu, Loyalty Islands; *Helix pomatia*, with winter epiphragm and mounted darts from France. Wanted, rare tropical land shells.—William Moss, 13 Milton Place, Ashton-under-Lyne.

OVER 100 species of foreign land shells, including many operculates, offered in exchange for foreign land shells not in collection. Lists exchanged. Foreign exchange invited.—Edward Collier, 1 Heather Bank, Moss Lane East, Manchester.

WANTED, SCIENCE-GOSSIP for 1868 and 1884, bound or in parts, or the number for April 1868.—J. G. Wright, Tettenhall Wood, Wolverhampton.

TWELVE vols. SCIENCE-GOSSIP, 1881–92, clean, unbound, with plates complete. Wanted, microscopic or photographic apparatus or offers.—T. Richardson, 13 Cavendish Road, Aldershot, Hants.

OFFERED, a private collection of nearly 1000 well-mounted slides, illustrating all branches of microscopy; also a collection of 236 sea-weeds.—C. O. Sonntag, 171 Dalkeith Road, Edinburgh.

BRITISH *Teredo fimbriata* (= *palmulata*) and pallets, and samples of the bored wood, offered for British marine shells not in collection, or foreign land shells.—W. Hy. Heathcote, M.C.S., 54 Frenchwood Street, Preston, Lancs.

WANTED, larvæ or pupæ of *Melitæa cinxia*, and other local species. Can offer British and exotic lepidoptera, British land, freshwater and marine shells, fossils, etc., in exchange.—A. H. Shepherd, 81 Corinne Road, Tufnell Park, London.

EXOTIC butterflies: 200 species of papilio in duplicate; also numerous pieridæ, heliconias, etc. Lists exchanged. Wings of brilliant papilios, morphos, uranias, etc., for microscopic mounting.—J. C. Hudson, Railway Terrace, Cross Lane, near Manchester.

WANTED, good slides of forams, diatoms, and rotifera; also *Avicula hirundo*, and very rare shells. Liberal exchange in pretty and rare microscopic objects and other rare shells, etc. T. E. Sclater, Natural History Stores, Teignmouth.

FOR exchange, fine, clean, whole specimens of mountain limestone fossils—many species, including brachiopoda, gasteropoda, cephalopoda, and lamellibranchiata, and sections of beautifully-polished corals. Other good fossils from all formations are desired in exchange.—W. F. Holroyd, Castleton, *viâ* Sheffield.

WANTED, geological and ordnance survey maps of N. and S.E. England, geological works, &c., in exchange for natural history specimens, classical, foreign and other books.—C. Rowland, 32 Essex Road, Acton.

ROTIFERA.—Wanted, well-mounted micro. slides of rotifers. A liberal exchange in high-class slides of bacteria, parasites, vegetable preparations, etc., or books.—Mason, 203 Ebury Street, Eaton Square, London, S.W.

WANTED, SCIENCE-GOSSIP for March 1884, also good petrological microscope, Swift's preferred.—Platt, 14 King Street South, Rochdale.

MICRO. slides (chiefly diatoms) in exchange for others, diatom foraminifera or bacteria slides preferred. Lists exchanged.—Hutton, Broadbottom, Manchester.

WILL any kind friend help a youth who is beginning to study the coleoptera, by giving him any spare type specimens of families or genera? Postage willingly paid.—W., 106 Trinity Road, Birmingham.

BEETLES from N.S. Wales, in exchange for British land, freshwater, marine, or foreign shells.—John Roseburgh, 54 Market Street, Galashiels.

WANTED, parallel plate compressorium (Beck's). Apply, stating requirements, to—F. R. Rowley, Town Museum, Leicester.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The International Journal of Microscopy and Natural Science" (London: Baillière, Tindall & Cox).—"The Idler" (London: Chatto & Windus).—"The Gentleman's Magazine" (London: Chatto & Windus).—"The Conchologist" (London: Swan Sonnenschein & Co.).—"Aids to Biology" by Joseph W. Williams (London: Baillière, Tindall & Cox).—"Laws and Properties of Matter," by R. T. Glazebrook (London: Kegan Paul, Trench, Trübner & Co.).—"An Account of British Flies (Diptera), by Fred V. Theobald, B.A., F.E.S., (London: Elliot Stock).—"The American Microscopical Journal" (Smiley, Washington).—"The Microscope," February.—"British Fungus Flora," by George Massee (George Bell & Sons), etc., etc.

COMMUNICATIONS RECEIVED UP TO THE 10TH ULT. FROM: J. E. W.—E. C.—W. M.—P. T.—C. L.—W. R.—H. A. G.—J. R.—Rev. E. A. H.—S. S. P.—F. R. R.—F. S.—J. S. C.—E. W. C.—P. J. R.—G. S.—J. H.—J. S.—Mrs. A. O. C. and H.—W. C. H.—W. E. C.—etc., etc.

ANOTHER CONTRIBUTION TO THE "RED LEAF" CONTROVERSY.

By G. W. BULMAN, M.A.

THE question whether the controversy started by my paper on "A Red Leaf" should be continued, or whether, both sides having been heard, the matter should be allowed to rest, has proved a difficult one. On carefully thinking over Mr. Tansley's last paper on the subject, however, I find an answer seems advisable—at least from my point of view.

In the first place, I should like to define the position I have taken up on the "insect-selection theory" a little more clearly, since there seems to be some slight misunderstanding on this point. I should also like to clear up some suggestions of inconsistency, and the charge of fallacy brought against me, both of which seem to have arisen from a misconception of my meaning.

Following Mr. Tansley's remarks seriatim, I shall endeavour to accomplish these objects, taking advantage of any opportunity to strengthen and make clearer my arguments by fresh facts and reasoning. And since I find that the authority of Hermann Müller is considered conclusive, I shall endeavour to point out that his facts, apart from his conclusions, afford me abundant support. Indeed I venture to assert that if anyone will read Müller's "Fertilization of Flowers," and draw his own conclusions instead of those of the author, he will be cured of the idea that bees show any preference for red and blue flowers, or that a race of such could be evolved by their selective action.

As to the red leaf itself there seems little advantage in discussing it further here, although much might be said as to the bright colours often displayed by leaves, and not always as attributes of the period of decay,—since, as I have already pointed out, my arguments from it are admitted.

With regard to the "fallacy" which is seen to underlie my remarks, surely the accusation arises from the idea that I have drawn from it some further inference. "Of course," says Mr. Tansley, "the colours of petals may have been developed without insect selection"—and I ask nothing further. "The question is," he continues, "is it likely?" And this I answer, not from the red leaf, but from observations on the habits of bees. I must pass over also the question of function—it is too wide and deep a one to be treated of in this connection. For my own part, I cannot see that difference in functional significance necessarily implies difference of origin, whether we found our arguments on the nature of things, or on the principles of natural selection. I shall, however, accept, for the sake of argument, Mr. Tansley's assumptions on the subject. I daresay he is quite right in saying, that having been led to the conclusion that the function of the colours of flowers is to attract insects, the general theory of colour development follows by help of the principles of natural selection.

But the question arises—and this is the point at issue—are we right in applying those principles in this way? The case stands thus: Let it be granted, on the one hand, that it follows on the application of the hypothesis of natural selection to certain facts and assumptions that the colour and form of certain flowers have been evolved by the selective action of certain insects. On the other hand, starting from facts and first principles, I arrive at the conclusion that they cannot have been so evolved.

The obvious inference—if my facts and reasoning are correct—is, that the principles of natural selection are wrong, or not applicable in this particular way, or else that some unjustifiable assumption has been made. Such being the position, it is clear that my arguments cannot be met by the assumption of the principles of natural selection; they must be answered by facts and first principles. My conclusions must stand or fall on the intrinsic value of my facts and reasoning.

With regard to the red stigmas of Corylus, if it is open to Müller to consider "that the red colour of the stigmas is solely an effect of chemical processes connected with the development of the female flowers to maturity," I see no reason why anyone should not give the same explanation (?) of the red of the poppy. In both cases it is obviously the result of chemical change, as far as the individual flower is concerned; the difference, according to Müller's view, is that while the red of Corylus has reached perfection without the aid of insect selection, that of the poppy has been evolved from a chance tendency to red in some remote ancestor, by their selective action. The distinction drawn by Mr. Tansley between the two eases is certainly a strange one. If the red of Corylus, which appears with the same regularity generation after generation as that of the poppy, is not hereditary, what is heredity? Surely the colour in each case is brought about by "something which must happen in the economy of the plant." But surely also in each case the colour is hereditary, as the word is usually understood. Certainly the red of Corylus is "made permanent in the species," whether from a functional reason or not.

And it is to be noted, as I have already pointed out, that Müller was only led to his opinion by the fact that, in his experience, these female flowers of Corylus were not visited by insects. Had he afterwards found insects upon them, he would, doubtless, have concluded that they were, like other red flowers, developed by insect selection. Possibly even yet it may be found that they are insect-visited, and Corylus removed from its present anomalous position. And Müller himself attributed the colours of the reproductive organs of certain plants to insect selection: "The colour of the perianth in Liliaceæ must originally have been greenish, as it still is in Paris, while the flowers at first made themselves conspicuous to insects by the colour of the reproductive organs."*

I am sorry to find that I have attributed to Mr. Tansley a "stereotyping" theory of which he is innocent, and thereby impeached the orthodoxy of his Darwinism. For this mistake I apologise, and at the same time thank him for thus more clearly defining his position. As to whether the assertion that "the 'bees' were not bees at all" affects in any way the argument against which it is brought, I shall leave to the reader to judge. I could show, however, from the writings of Müller and Grant Allen, that, whatever the creatures *were* at the time when blue flowers were not, *they*, at least, *call* them *bees*. But it seems a case in which we may appositely ask, "What's in a name?"

Whatever they were, if their taste for blue was a thing to be gained by experience of blue flowers, they could not evolve a race of these by the exercise thereof.

The quotation given from Müller at this point seems to indicate that he attributes a colour-sense not gained by experience: "There arose others more skilful and intelligent, with longer tongues and acuter colour-sense; and they gradually caused the production of flowers with more varied colours, with honey invisible to or beyond the reach of the less intelligent short-tongued guests, etc." And how did they *cause the production* of such modifications? Presumably by their acuter colour-sense and longer tongues. And how did they acquire this acuter colour-sense? Certainly not from the more varied eolours, since it required the acuter sense to produce these.

But if it is urged that this colour-sense is not a taste which would lead the insect to select flowers with a tendency to the colour in question, it could be of no avail in evolving the colour.

After this quotation from Müller, we are further told that the theory must rest on the supposition that bees grew to recognise blue or red as an index of high specialisation, for its taste for blue eannot have been derived from any other source. And "thus the statement under which, according to Mr. Bulman, 'the whole theory collapses,' is absolutely necessary for its support." In faet, Mr. Tansley has shown that the statement is absolutely essential to the theory; I have shown that it is absolutely fatal to it. Thus between us we have shown that the theory is impossible, whether the statement be true or not. It is of eourse for readers to judge of the merits of our respective arguments.

I am glad to find passages quoted from Grant Allen, showing that he upholds the theory that the bees' taste for blue arises from the fact that blue is the colour of the most advanced flowers. At the same time, the quotation I gave in my last paper from his "Monkswood" requires a bee whose taste for blue was in existence at the time when the flowers began to acquire a shade of blue; this taste, then, could not arise from the bee's experience that blue flowers were best suited for it. I shall not attempt to reconcile the apparent discrepancy, but I think I can explain the reason of its existence. Grant Allen has, in fact, two distinct types of bee, which he uses on different occasions.

If we suppose a race of bees launched suddenly into a region of flowers where all the most highly specialised and blue flowers are the largest honey-bearers, we can easily believe that they will learn in

* "The Fertilization of Flowers," p. 559.

time to select them. But, suppose we take this race of bees, which thus accept the teaching of experience, and set them down in a region where there are as yet no blue flowers: what will happen? They will learn to associate honey with white and yellow, or whatever the colours may be. The result of this will be—well, certainly, not to cause them to select those flowers which began to show a shade of blue. No, *this* bee will not do, and so Grant Allen brings out his *other* bee.

Suppose now a bee which has acquired, or been gifted with a taste for blue, by any means, whatever, except by an experience of blue flowers. Set it down among a race of flowers of another colour, which are beginning to acquire a blue tinge. Suppose it perseveringly selects the blue, and you get an explanation of the origin of blue flowers, which satisfies some people. This is the bee by means of which Grant Allen evolves his Monkshood; the orgin of its taste remaining a mystery. When it is a question of explaining the origin of blue flowers you use this bee; when you wish to account for the bee's taste for blue you use the other. It is an important point that when the one is in use the other should be kept out of sight; and a similar method is very largely used when the principles of natural selection are brought down from the general to the particular; from the plausible assertion of principles to the difficult task of explaining the origin of any particular organism.

In my original paper I brought forward the case of the periwinkle, and the common scarlet poppy as markedly blue and red flowers not frequented by bees. Along with other facts, I considered it to show that bees do not prefer blue and red to other colours. This was met by the statement from Müller that *Vinca minor* is visited by seven species of bees, and *Papaver rhœas* by seven also. In reply, I pointed out that the number of individual bee-visits, and not the nnmber of species, was the important point. This again is met by the supposition that in these cases the number of visits is roughly proportioned to the number of species. And this is apparently supposed to take away the force from my argument. I can show, however, that Müller's observations on the above supposition lead to the same conclusion that I drew from my own.

With regard to *Vinca minor* there is evidently something requiring explanation, for while Müller states that he has seen it *abundantly* visited by insects; he also informs us that other celebrated observers—Sprengel, Darwin, Delphino, and Hildebrand—seem never to have seen any insects upon it but thrips. On *Vinca major*, which differs from *Vinca minor* chiefly in size, Müller once saw *Bombus agrorum*. But, accepting the seven species seen on *Vinca minor* as representative, the record, when compared with the same observer's notes of visits to white, yellow, and green flowers, is not good enough to show that bees prefer blue. For example, of white flowers, the inconspicuous chickweed, *Stellaria media*, has six species, and *Lamium album* sixteen; of yellow flowers, dandelion has fifty-eight, and *Ranunculus ficaria* eight; of green flowers, the raspberry has eleven, and the gooseberry nine species. The blue *Linum usitatissimum* has a record of two.

As to the poppy, Müller's list shows it to be much more frequently visited than I had supposed; but when we compare it with the first of a nearly-related *yellow* flower, *Chelodonium majus*, we find the number of species the same, viz., seven. Therefore the case of *Papaver rhœas* supports the view that bees do not prefer red. It would be interesting if other observers would give their results as to these flowers.

But while I have endeavoured to show that, taking the number of species as roughly proportional to the number of individual visits, Müller's observations point also to the conclusion that bees do not prefer blue and red, I am far from thinking the method may not, in many cases, be very misleading, as I have before hinted. Many of Muller's species of bees are doubtless rare, and it can hardly be supposed that his lists are complete. This appears evident when it is noted that he records only two species as visiting the lime, *Tilia Europæa*. No one, surely, would be disposed to deny that this flower receives more bee-visits than chickweed or dandelion. If, however, the number of individual visits could be taken, I believe the same conclusion would be pointed to.

With regard to my observations—why does Mr. Tansley, by-the-way, call them experiments?—on the comparative number of visits to *Veronica Buxbaumii* and *Stellaria media*, I find that Muller's records are quite similar; taking, as before, number of species as our criterion. Unfortunately he does not mention *V. Buxbaumii*, but, perhaps, *V. chamædrys* will do as well. To compare with the five species of *Stellaria media*, it has a record of four, whilst *V. spicata* has two.

As to Mr. Tansley's distrust of my observations I shall say nothing; it is quite fit and proper that he should prefer Sir John Lubbock's experiments. Doubtless, as he suggests, my results are capable of being "explained away."

And, by-the-way, it is Grant Allen who speaks of Sir John Lubbock having *taught* the bees. "Sir John put drops of honey on slips of glass above coloured paper; and when he had once *taught* a bee to feed from one slip, say the blue, he found that it would return straight to that slip, even when the relative places of the colours had been transposed."* But I also hope it was not *really* a matter of "teaching."

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* "Knowledge," April 14th, 1883, p. 508.

On the subject of the colour, etc., of the most advanced flower, it is suggested that I have shown a little inconsistency. I ventured to dispute the assertion that the colours of the so-called most advanced flowers are most frequently blue. In doing so, I pointed out that, among our native flowers, those which are considered most advanced—not those which I consider most advanced, I have no theory on the subject—do not contain the majority of the blue ones; while many blue flowers are simple and possess the "lowly mark of symmetry." Now, in using this latter expression, I was not advancing any opinion of my own, as Mr. Tansley seems to think, and hence my supposed inconsistency, but simply stating what I conceive to be the generally accepted idea, in accordance with the dictum that evolution proceeds "from the homogeneous to the heterogeneous." My object then was simply to point out that among these so-called highly-advanced flowers blue does not preponderate; while at the same time many so-called simple flowers are blue.

On carefully looking over the remarks on the examples I brought forward, I cannot think that any case has been shown against me, except as to the Veronicas. I give up the Veronicas in deference to Müller, who says that the genus is by no means a primitive one in its order. "The symmetrical flowers" and other characters of Veronica are widely removed from the "primitive type," presumably the hypothetical ancestor. It thus appears, by-the-way, that Müller does not consider symmetry a mark of lowliness.

With regard to the orchids, surely Mr. Tansley cannot think he has met my argument by his quotation from Grant Allen, to the effect that they have mostly got beyond the monochromatic stage altogether. They are still amongst the "mostly highly advanced flowers," and are not blue; which is all I required of them.

With regard to the orders Boraginaceæ and Campanulaceæ, I do not know where they are usually placed in the scale of advance by the authorities, but I should think, below Orchidaceæ, Compositæ and Leguminosæ, although containing a larger percentage of blue than any one of these. I am referring here to our native plants only.

As to the Compositæ, Grant Allen's hypothesis is that the yellow ligulate ones have advanced beyond the blue stage—it is the primitive forms of the order which are blue. In other words, the yellow are more advanced than the blue; this is quite all my argument required. And if such a process of advance is constantly taking place, who would expect to find any preponderance of blue among the more advanced flowers? Mr. Tansley is surely unfortunate in the quotations he brings forward against me!

With regard to Verbaseum, Müller's list of visitors to *V. phœniceum*, which I presume is the one in question, contains five species of bees, as well as the one very abundant species of Syrphidæ; and Hepatica is stated to be visited by "bees and Syrphidæ." It is perhaps, a little "startling" to find that a writer like Müller, while labouring to find support for a theory, should make a statement which entirely destroys it. And yet there are many things recorded in the "Fertilization of Flowers" which are directly opposed to the theory in question. In this particular case it may, perhaps, be accounted for by the fact that the statement in question is the result of experience, while the theory rests more or less on assumption.

I am sorry to find that Mr. Tansley thinks I have misused this statement by giving the wrong context. As far as I remember, I gave no context at all. I did, however, use the word "bee" instead of "anthophilous insect." If the statement is true of anthophilous insects it is true of bees, which are anthophilous; therefore, it was quite legitimate to make the substitution. I never imagined, nor do I yet think, that the argument gained anything by the change; I simply wished to direct special attention to bees—my special subject. I presume I also omitted the words "in general"—is this what Mr. Tansley means by saying I have given the wrong context?—but my argument is not really affected by the expression.

I maintain, that for any race of insects to develop a race of flowers by their selective action on Darwinian principles, they *must confine* themselves to those *varying in the right direction.* These varieties must be carefully selected for many generations, to the exclusion of those not varying in the right direction. Even if they had "hereditary preferences," they could not differentiate a new race, unless they confined themselves to those varying in the direction of this choice. And how can they obtain an "hereditary preference," say, for blue, except by being used to blue flowers for generations? And if the "hereditary preference" requires generations of blue flowers to develop it, what assistance can it be in evolving the same from a race of white or yellow?

According to the Darwinian philosophy, a chance or aimless variation obtains some advantage in the struggle for existence, and leaves a stronger and more numerous progeny. In the case of flowers, the advantage is supposed to arise from the cross-fertilization effected by insects, etc. A few forms differing slightly from the rest in colour, etc., would be crossed freely with the normal type, and so be lost, unless some race of insects *confined themselves strictly for many generations* to these few chance variations. And apart from the question of taste, how could any race of insects obtain sufficient food if they thus confined themselves?

No, if they "wander about, getting their food on whatever flowers they find it," they cannot evolve a race of blue from white, yellow, or red flowers. And if, as Müller asserts, "they require differentiation in colour" to *enable* them "on their journeys to keep to a single species of flower," how can their visits have produced that differentiation?

Another quotation will perhaps help to show that I have not made any unfair use of an isolated passage: "Anthophilous insects are not *guided* by hereditary instinct to particular flowers." *

Since, then, my argument did not depend at all on the absence of the words "in general;" and that "anthophilous insects," although not synonymous with bees, yet includes them, I think it stands untouched. If, however, Mr. Tansley still thinks it falls to pieces before his logic, I shall feel obliged if he will point out more definitely the exact point where it breaks down.

As to the curious fact that I should write nine columns of reply to a series of facts and arguments which I thought did not really oppose my views, I can only say that it required nine to show that this was so.

With regard to the question of bees visiting unopened and fading flowers, it is a matter of fact that they occasionally do so; Müller records instances of the former, and I have myself noticed the latter, and have, moreover, seen them on flowers which had lost all their petals. But of course such visits are comparatively rare; I quite agree that bees are too intelligent—whatever that word may mean when applied to insects—to persevere in such visits; although it seems as if they had to learn by individual experience. And if the new colours appeared first at such times the bees would not learn to select them, and so it *is* clear that the new colours "could not be evolved *from* colours appearing after fertilization."

Bearing in mind the very widespread tendency of white flowers to be red or pink before or after expansion, the only inference seems to be that at the time when flowers had not got beyond the white stage, bees would in general learn to avoid red. But, as a matter of fact, I never assumed that bees were so unintelligent as to visit pink buds and fading blossoms. I simply pointed out that if they were attracted by the red colour in the same, they would, on the educational theory, learn to distrust red from finding less to reward them.

In conclusion, Mr. Tansley asserts that the general principle of the theory of colour development remains untouched. I shall leave readers of SCIENCE-GOSSIP to judge whether this is so or not.

I may add a word here on Mr. Tansley's criticism of my fragment, "The Bee and the Willow" (SCIENCE-GOSSIP, June, 1889). In the quotation at the beginning of my paper, Grant Allen, in speaking of "fertilizing insects," evidently means bees. This is clear when we take the passage in full. "Among them the bees are busy already, for you hardly ever see a willow-catkin in full bloom without a bevy of its attendant fertilising insects."* I certainly did think at the time that in this Grant Allen was only expressing the usually received opinion; but I assumed nothing except that it was his own. But on consulting Müller's account, I find that he considers the willow *insect*-fertilized; and a glance at his list of species indicates at once that bees play the chief part. Of the eighty-six species of insects forty-six are bees, and they, from their superior industry, pay more frequent visits than the others. I I do not think the fact that a great variety of other insects visit the willow alters the case much; there seems no doubt that the chief visitors are bees. At least it is so in my experience, for though I have frequently seen bees in thousands on every willow-bush I passed, I have never noticed any other insects.

Müller's facts, as stated by Mr. Tansley, are not sufficient to show that the willow is regularly cross-fertilized by insects. Of the forty-two species which come for honey alone, none, of course, will fertilize at all; and if the thirty-eight which come for both gather their complete load of pollen and then go for honey, they will only fertilize a few of the female flowers they visit first, but if they complete their load of honey first they will again effect no fertilization. Only in the case of frequent passing from male to female blossoms can insect-fertilization be accomplished at all regularly.

The point then to be settled is, do the bees thus flit backwards and forwards from bush to bush—the male bush, it is to be noted, is frequently at some little distance from the female—or do they get a complete load off the one before going to the other? Another interesting point is, do they usually load honey or pollen first? Perhaps some readers of SCIENCE-GOSSIP can settle these questions. I drew particular attention to the former in my paper, and I do not think Mr. Tansley has thrown any fresh light upon it, nor do Müller's observations settle it. And the fact remains that the willows have been persistently visited by myriads of bees for hundreds of years without developing a blue variety. How then—if they really fertilize the plant—can it be believed that bees *select* flowers showing a tendency to blue, and by their persistent choice through many generations are able to differentiate and perpetuate a race of blue flowers? And, according to Grant Allen, the willow is descended from ancestors with brightly-coloured petals through wind-fertilized forms!

The Noctuæ, by the way, described by Mr. Tansley as visiting the willow, being honey-suckers, will not effect fertilization.

* "Fertilization of Flowers," p. 571.

* "Knowledge," February 23rd, 1883, p. 112.

NOTES ON THE ORCHIDACEÆ.

By H. E. Griset.

AMONG the Petaloid Monocotyledones there are few orders that equal the Orchidaceæ for botanical interest and study. In the 16* or 18† genera the species contained therein are thirty-six and thirty-seven respectively; this is accounted for by the two genera, Gymnadenia, Br., and Neotenia, Reich. fil. (both containing a single species), in the former, being included in the genus Hebenaria, Br.; furthermore, *Orchis purpurea*, Huds., a species in the latter, is contained as a sub-species of *O. militaris*, Linn., in the other.

Fig. 73.—*Aceras anthropophora*, Br.

All our indigenous species are terrestrial perennial herbs; a few have large showy flowers (*e.g. Cypripedium calceolus*, Linn., etc.), but they are more usually small and less showy; a few inconspicuous flowered species are common, but the order contains many more rare and local species.

The flowers of *Gymnadenia conopsea*, Br., are much like those of some of the species of the typical genus Orchis, like *O. pyramidalis*, Linn., except that the spur is much lengthened; the same of *Aceras anthropophora*, Br., greatly resemble those of the rare *O. hircina*, Linn. (*Loroglossum hircinum*, Rich.), save that they are much smaller, and the spur o.

Aceras anthropophora, Br., is a small yellowish green herb, 6 to 12, or even 15 inches high; the spikes are cylindrical, 2, 3, or 4 inches in length, composed of numerous odd, little purple-brown and yellow flowers; leaves entire, oblong, or lanceolate, mostly radical; tubercules testiculate, long ovoid, half to nearly 1 inch long, the younger one often on an extra-prolongation, sometimes of nearly 1 inch long (which is not uncommonly the case with *Orchis mascula*, Linn., and some others). This species I have found quite abundant on the borders of "'chalk' and 'limestone' downs" near Kemsing, growing in company with *Ophrys muscifera*, Huds., and *O. apifera*, Huds., among "beds" of the pretty little *Asperula cynanchica*, Linn.

In selecting specimens for the herbarium, of some of the Orchideæ, it will be found advantageous to obtain one with the dried stem and seed capsules of the preceding year; and if they are dug with great care, the remains of the tubercules of preceding years may be preserved, as with the corms of *Arum maculatum*, Linn.,* thus rendering the specimen still more perfect and natural (Fig. 73). The stomata of the Orchidaceæ are most beautiful objects for their study microscopically, being comparatively large (Fig. 74); in *A. anthropophora*, Br., they are sub-orbicular; the seeds are very minute, having a lax, reticulate, transparent testa, enclosing a globose embryo (Fig. 75), which is often very small or o.

The following is an account of an exceptionally large abnormal specimen of *Gymnadenia conopsea*, Br., I found near Shoreham, Kent, July 11, 1892, and which appears to me to be an anologous "freak" to that represented by the following brief footnote in the "British Flora."† "A single specimen has been occasionally found of Orchis and Hebenaria, in which the flowers are all deformed, without any spur; but such instances are very rare." A stout herb, 18 inches high; the palmate tubercules were very large, the younger one being double, $1\frac{1}{2}$ inch across, with five pairs of divisions; the older tubercule was 2 inches across, with four single divisions; the leaves were also all very large but narrow. The spike was $4\frac{1}{2}$ inches long, the flowers of the upper half of which were all abnormal, without the least trace of a spur, or essential organs; they were in the axils of enlarged

* "British Flora," Benth. & Hook.
† "Student's Flora," Sir J. D. Hooker.

* Science-Gossip, October 1892, p. 218.
† P. 435.

bractæ, and presented transitions from a petaloid ligule to lanceolate, or navicular petaloid expansions (Fig. 76). The flowers of the lower half were normal, excepting that the spurs varied from a mere process to little over an inch long ($\frac{5}{8}$). Some of the flowers were perfectly abortive.

I do not think the orchids are very free seeders as a whole; among the best are included the commonest species—*Epipactis latifolia*, Sw., *Listera ovata*, Br., *Hebenaria canopsea*, Linn., *Orchis maculata*, Linn., and perhaps *Aceras anthropophora*, Br., and also *Cephalanthera grandiflora*, Bab. The latter requires

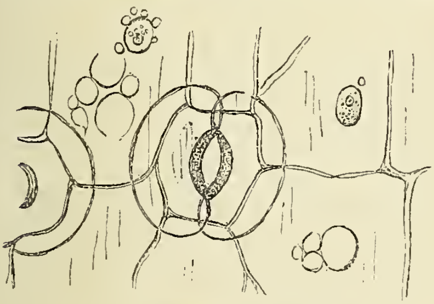

Fig. 74.—Stomata of *A. anthropophora.*

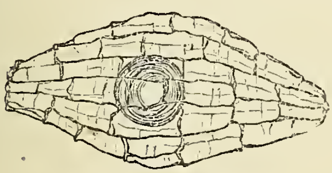

Fig. 75.—Seed of same × 100.

Fig. 76.—*Gymnadenia conopsea.* Anomalous flowers.

from the antheses of the flowers in May to the end of August or September, to mature its seeds; even then the capsules do not always dehisce, but wither, and subsequently fall to the ground. *Anacamptis pyramidalis*, Rich., is anything but a good seed producer. I have repeatedly made careful observations on many of these plants, from their flowering time to the end of August, or later, and have found that scarcely fifteen per cent. of the capsules matured, and produced good seeds; the locality and situation must undoubtedly have much influence in matter of this kind. Most of the above were in "pine-copses" on limestone.

Some of the tubercule-bearing orchids do not flower annually without intermission, which is confirmed by the appended examples. On a small spot on one of the chalk downs in "Mid Kent" *Ophrys muscifera*, Huds., was exceptionally abundant; among others I noted a very large specimen $18\frac{1}{2}$ inches high, with a spike of eleven flowers and bud.* At the flowering-time (June) in the next year, I made an excursion to the same place, with the object of making further observations on this and other species; when I arrived they appeared no more abundant here than elsewhere, but as the exact situation of the large specimen had been previously marked, and which had evidently not appeared, I dug for the tubercules, to ascertain whether they were not dormant, which afterwards I found actually to be the case. Again there were several luxuriant specimens of *Epipactis latifolia*, Sw., growing on the borders of a copse near Highgate; the next year none made their appearance, which seemed to me to be a similar case to the above. This year they have already (April 2) commenced to put forth shoots. Precisely the same thing presented itself to me in Sussex with *E. latifolia*, Sw., and in Kent with whole banks of numerous *O. pyramidalis*, Linn.

THE ENTOMOLOGICAL SPRING OF 1893 AT IPSWICH.

By Claude Morley.

THE early months of the present year will long live in the minds of all botanists and entomologists. Perhaps a few notes upon them spent among the delightful woods and lanes of East Anglia, which are trembling under the prospect of becoming smothered some day in a coal-mining district, may be acceptable to those who are compiling local lists of the various Orders of Insects. To the lepidopterist—I speak for myself—spring commences with the appearance of *Hybernia rupicapraria*, whose penchant for ponds and puddles I alluded to in these pages some little time ago, and I have to thank Mr. Holt for his kind reply. Therefore the winter is of but short duration, ceasing this year on the 30th of January, when I found the above-named species, together with *C. brumata* and a hibernated *Cerastis vaccinii*, on water, and took the local *Hybernia leucophœaria* flying by day at that grand old hunting-ground, which our grandfathers loved and patronised, the Belstead Woods. Thus it was that I flung off the cloak of winter sloth and awoke to the work of the new year. On the same day I took pupæ of *Smerinthus tiliæ*, *Biston hirtaria*, *Amphydasis betularia*, *Axylia putris* and *Tæniocampa gothica;* and my Coleoptera, mostly from the sods at the base of trees, comprised: *Ocypus olens*, *Pristonychus terricola*, *Pterostichus madidus*, *Amara plebia*,

* From a specimen in my herbarium.

Calathus mollis, and the débris of *Leucanus cervus* at the base of an oak.

February, up to about the 24th, was very wet and dull; however, I stuck to pupa digging, and was rewarded by the following result:—Almost any number of *Tæniocampa incerta*, *T. stabilis*, *T. gothica*, and *Spilosoma menthastri* from various trees; *Smerinthus populi* and *S. tiliæ* from their respective trees; *Amphydasis betularia*, and *Biston hirtaria*, which I thought was rare everywhere excepting in the squares of London, but which has turned up here at the roots of almost every description of tree, and also on gas lamps; a solitary specimen of *Hybernia marginaria*, which I turned up at the base of a poplar—I have often taken them from aspens—completes the list. The larvæ of *Apamea unanimis* were, curiously enough, hibernating at the roots of aspens, just below the surface in little earthen cocoons in damp sods, instead of, as is their general wont, under the bark. I took a dozen in such a situation. February was somewhat rich in Coleoptera, which turned up at the base of trees galore. I took, amongst others, the following: *Carabus granulatus*, *Clavina fossor*, *Pristonychus terricola*, *Pterostichus vulgaris*, *P. subcyaneus*, *Calathus mollis*, *Amara attenuatus*, *A. curta*, *Pterostichus inæqualis*, *Bembidium doris*, *Ocypus olens*, *Creophilus maxilosus*, *Hydroporus palustris*, *Gyrinus natator*, *Silpha atrata*, *Aphodius contaminatus* from a dead heron, and *A. fossor*, *Balaninus rubidus*, *Apion vorax* and *Erirhinus tremulæ*, both of which were exceedingly plentiful under bark on poplars and willows, *Lema cyanella*, and *Coccinella 14-punctata*.

March, at any rate the latter half, was, as everyone knows, phenomenally fine and hot, the total rainfall here for the month being only ·33 inch, and the thermometer upon several days reaching a height of 68°, and once 70° F. Snow fell for about a quarter of an hour on the 17th, about 9 a.m. But from the 20th to the close of the month no rain fell—scarcely indeed was there a cloud in the sky; easterly winds held sway, however, during the 25th to 30th, when it came round south west. Frosts continued during the east winds. Alder was in leaf on the 8th, and rose on the 20th; at the end of the month aspens were budding; sallows were, for the most part, in leaf; elm, *Populus niger* and *P. balsamifera* were budding; weeping willow was a beautiful pale green; whitethorn was, in places, quite out, making the hedges look green; violets were on the wane and primroses going off. Moths now began to emerge, and beetles became an everyday sight, running across paths and on hedges. Lepidopterous larvæ also were to be taken at dusk by the aid of a lantern. On the second of the month I took *Odonestis potatoria*, *Triphæna pronuba*, and several others in this way. *Hybernia marginaria* and *H. rupicapraria*, the latter nearly over, were to be seen on the lamps every evening; *Tæniocampa stabilis* emerged on the 4th, and *T. gothica* on the 5th; on the 8th I again took *Hybernia leucophæaria*, this time from water, and *Cerastis vaccinii* from a fence. On the 10th I took the first *Tæniocampa incerta* "at large," having bred it as early as the 12th and 22nd of February. The three common *Tæniocampæ* continued to emerge up to the end of the month. On the 5th I took *Carabus nemoralis*, *Geotrupes mutator*, and *G. stercorarius*; on the 8th I saw the first *Anisopteryx æscularia*, as against March 27th last year. *Vanessa urticæ* was seen on the wing on the 14th. The 31st of March gave me a very sure sign of the forwardness of the season by the appearance of *Pieris rapæ*, gamboling about as if it were the hottest day in May. Besides the above-mentioned species, March also gave me another example of *Clivina fossor*, which is considered rather a rare beetle about here; *Stenolophus dorsalis*, and two members of the genus *Achomenus*, one bright blue, the other scarlet with blue elytra, which I have not yet identified—if anyone will be so good as to send me their respective cognomens I shall feel much obliged. I also took *Amara plebia*, *A. bifrons*, *A. tribialis*, *Nebria brevicollis*, *Calathus melanocephalus*, *Pterostichus niger*, *Ocypus similis*, and *Philonthus politus*, *Ammæcus brevis*, *Athous parvulus*, *A. vittalis*, and a member of the genus *Chrysomela*.

April is a month the memory of which lies deeply embedded in the mind of every lover of nature. Not only did the thermometer stand almost permanently at summer-heat, not only did the barometer point to an abnormally high degree, not only was there barely any wind throughout the month, but, during the daytime, the sun rarely went in, and the clouds in the sky could almost invariably be counted on the fingers of one hand. It was truly a glorious month—this usually gusty, frivolous, uncertain month of April. Insects ran riot. Insects which in ordinary years do not put in an appearance until the middle of May—in some years the end of May, were abroad on the 4th of April: such, for instance, as *Lycæna argiolus*, which I took together with *Vanessa urticæ* and *V. Io*, old enough to be its grandfathers!

I was greeted on the 1st of April, not by some wag with a so-called *witty* catch, but by the first *Biston hirtaria*; later I took *Coccinella septempunctata*, and *Meloë violaceus*, *Choleva*, and *Silpha sinuata* from a dead mole [*Talpa vulgaris*]. On the 3rd I took *Amara similata*, various other small *Adephaga* and a specimen of the water-scorpion [*Nepa cinerea*], apparently "basking" in the sun, quite out of the water, on a piece of board. I also took *Bombylius major*, which appears very common here. *P. rapæ* now begins to become numerous. On the 4th of April the first specimen of *Trichiosoma lucornum*—a large number of which I breed every year, more for the pleasure of seeing them *cut* their way out than from any "collective" reason—emerged. *Silpha rugosa*, *S. thoracica* and *Necrophorus humator* were common in dead rabbits, etc., and the afore-mentioned *Choleva*, and *Hister bimaculatus* in moles, etc. Water was now teeming with insect life; *H. fucipes*, *P. melanocephalus*, small water-beetles and small water-boatmen [*Corixa Linnæi*] being met with in every piece of pond-weed in every pond and ditch, together with the larvæ of both the *Agrionidæ* and *Libellulidæ*. *Melanippe fluctuata*, that garden pest, emerged from its pupæ on the 6th. On the 8th of April the first *Smerinthus populi* underwent its ecdysis together with *Tæniocampa incerta*, which were pretty well over, and *Spilosoma menthastri*. Both *Bombus terrestris* and *B. lapidarius* were now very common, with a sprinkling of *B. Harristellus* and *B. muscorum*, *Colletes cunicularia*, *Andrena thoracica* and *A. cineraria*, and an occasional *Anthophora retusa*. By the 9th the larvæ of *A. caja* were getting quite large and very plentiful, together with *A. grossulariata*, which seems scarcer here than in most towns. I also took a specimen of *Silpha atrata* which appeared to have hardly developed properly, the usual black elytra being of quite a brown tinge. I have taken several in this apparently imperfectly coloured condition, the tinge being nearly always unicolorous and semi-transparent; I have also taken this variety, if variety it be, at Beccles, in North Suffolk. About the 10th of April *Pieris brassicæ* became common, and ten days later was flying about in hundreds together with *P. rapæ* and, in a lesser degree, *P. napi*. On the 12th, *Odontopera bidentata* emerged from pupa; the larvæ of this and the second, which put in an appearance on the 15th, I took from ivy on the Belstead Road last autumn. On April 14th I took a *Coccinella 22-punctata*. On the 15th I took *Nebria brevicollis*, *Amara similata*, *A. familiaris*, *Harpalus ruficornis*, *Calathus mollis*, *Loricera pilicornis*, *Clavina fossor*, and a large, long *Adephaga*, which is new to me. The 16th, although it was Sunday, was productive of *Amphydasis strataria*, a very fine specimen of which I took from a lamp about 9 p.m. The following morning, being stimulated by some stern entomological impulse, I turned out at 5 a.m., and found on lamps, despite a biting east wind and rain, a fine male *Biston hirtaria*, *Tæniocampa stabilis*, and *Coremia unidentaria*. Later the same day I took *Acilius sulcatus* and *Hyphydrus ovatus*, together with two new *Hydradephaga* in cop. On the 18th *Anisopteryx æscularia* was still on the lamps, and the 19th brought out *Smerinthus tiliæ* and *Amara acuminata* running on a path, also *Notonecta glauca* and various *Corixæ* from ponds. April 19th is a day that will have an abiding spot in my heart as being the first on which I ever took *Asphalia ridens*, two specimens of which I boxed from lamps, together with *Tæniocampa incerta* and *T. stabilis* (the very last), *Hemerophila abruptaria*, which seems fairly plentiful here, *Anticlea badiata* and *A. nigrofasciaria*, *Selenia bilunaria* and the last *Hybernia marginaria*. It was a wonderfully warm night, the thermometer at 2 a.m. the following morning registering 48° F. At dusk I took *Cidaria suffumata*, *Cilix glaucata*, and *Coremia ferrugata*. This is a very early appearance of *C. glaucata*, is it not? On the 20th *Amphydasis betularia*, *Phalera bucephala* and *Smerinthus tiliæ* emerged. A friend kindly gave me five fine *Blaps mucronata* from his cellar. I walked over to Sproughton, a village some three miles out, in the afternoon, and took the first *Ceononympha pamphilus* and *Strenia clathrata*, also *Patrobius excavatus*, *Amara plebia*, and *Liophilorus cadavarinus*. On April 23rd I bred one of the very dark varieties of *A. betularia*, about which there have lately been discussions in the pages of "The Entomologist." The 24th was certainly one of the most enjoyable, and probably one of the most productive, days up to the present time this year. *Argynnis euphrosyne* was flying about galore, making a strikingly pretty picture, their fuscus and black markings mingling beautifully with the bleached blossoms of *Viola canina*, which in places gave the ground quite a light blue tinge. The insects were very sluggish and easily taken, two pretty varieties being obtained; one, the usual one, in which the whole of the upper and lower surface is much paler than in the type, the other had all the black markings run together in a most curious fashion. Besides *A. euphrosyne*, of which I could have taken fifty or a hundred, I took one ♀ and three ♂ *Euchloë cardamines*, two *Lycæna argiolus*, three *Thecla rubi* and one *Bupalus piniaria*, and saw several others, together with *Selenia bilunaria*, *Larentia multistrigaria* and *C. dubitata* on water, and *Satyrus mægera*, *Polyommatus phlœas*, *G. rhamni*, and *Vanessa Io* and *V. urticæ* on the wing. On the 26th I took *Chrysomela polita*. The 28th was productive of *Euplexia lucipara*, which I consider another very early appearance, taken in an upper room, doubtless attracted by light.

May, after "playing around" and spoiling our drought record, which is a very good thing for the farmers and gardeners, has now settled down to what we may almost call our normal 1893 weather—hot sun, high thermometer, high barometer, with a breeze from the N.E. What if this weather continue, contrary to the predictions of the old German meteorologist of Berlin, Dr. Rudolf Falb, who holds that May is going to be an exceptionally dry month, but then our "1893 weather" is going to leave us? See what he says: "June less dry, and heavy rainfall throughout July, August, and September. But, of all the rainy months of the year, September will stand out as the month that has beaten the record." A cheerful prospect certainly. However, whether this be so or not, time will show; meanwhile, granting always that this weather holds, will it be too much to expect *Lucina* in the middle of May, *Sibylla* the end of May, and the large fritillaries in June? I think not.

The Museum, Ipswich.

A DOUBTFUL SPECIES OF THE GENUS ŒCISTES.

Sp. Ch.—Corona small reniform, with a wide dorsal gap; body long and slender; foot long, extensile, tapering, and markedly wrinkled; ventral antenna a small setigcrous tubercule; hooks, two dorsal, prominent, adnate at the base; tube floccose inconspicuous, or absent.

THE corona is small, slightly larger than the widest diameter of the body, and although in a side view apparently circular, is really reniform by the inbending of a wide dorsal gap. This latter is occupied when the corona is expanded by the tips of two large hooks, adnate at the base, which are prominent features when the Rotiferon is contracted. The body is slender and cylindrical, with patches of minute yellow granules at and near the junction with the foot. The ventral antenna is a setigerous pimple seated upon a small prominence, the upper surface of which is ciliated. The buccal orifice is lateral and strongly ciliated, sloping downward, but slightly in a dorsal direction, at the bottom two lip-like projections constantly open and shut, as if in the act of biting, but occasionally with a quick, upward jerk throw away some undesired morsel. The mastax in dorsal view is trilobate, enveloping the semi-globular trophi, whose teeth are three in number, and seemingly parallel. A long slender œsophagus, which is thrown into waves when the creature is feeding, leads to a thick walled, capacious stomach, filling the larger part of the body cavity; a marked constriction divides it from the intestine; gradually narrowing into a long rectum, it bends in an upward direction to the cloaca. The latter is bounded on either side by wart-like projections which become greatly distended in the act of passing fæces. The ovary frequently contains a large egg, more or less fully formed, while others are embedded in the flocculent mass that does duty for a case. The foot is tapering, deeply transverscly wrinkled, and very extensile; although not usually much longer than the body, occasionally it is stretched to fully two and a half times its length, and even then its corrugations are not appreciably smoothed out. Two muscular threads run from one end to the other, and near the junction with the trunk appear to pass through two thick swellings that may be the foot-glands. The case as a rule consists of an irregular accumulation of débris, hiding the base of the foot and quite inadequate as a protection; but even this is sometimes entirely dispensed with. In one instance, however, a pair were inhabiting a transparent gelatinous case only rendered visible by the particles of dirt adhering to it, and into which they retreated on alarm. It was more like the case that one sees occasionally investing a stentor, and I am not at all sure that they had not taken advantage of the empty dwelling of something else. In habit they are quiet, extremely timid, contracting at the slightest tap, but equally

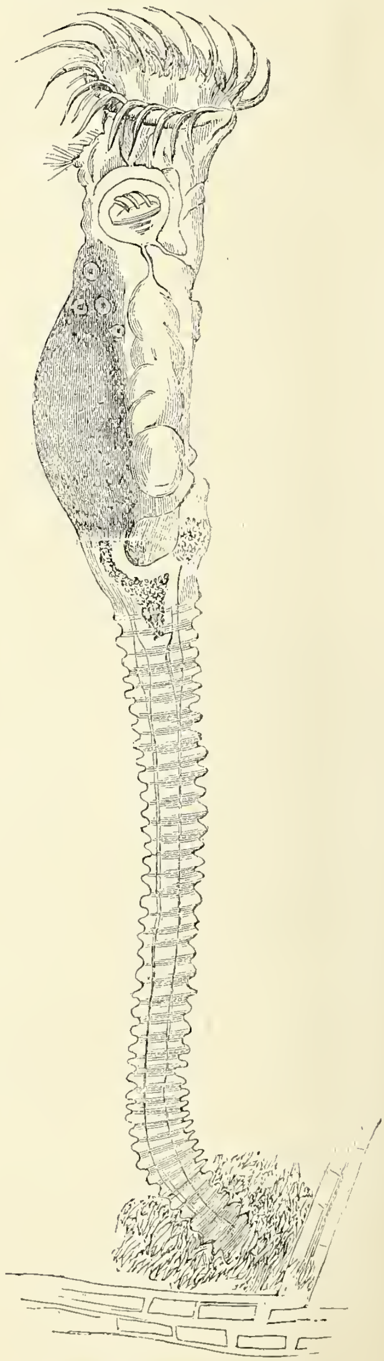

Fig. 77.—Œcistes, extended.

ready to expand again. Their favourite position is in the axils of the leaves and stems.

I first came across this Rotifer on the 19th of April, whilst searching some Callitriche taken from one of my aquaria that had been obtained in the previous October from either Hayes or Keston. The first impression was that it was *Œ. serpentinus*, but careful examination showed several discrepancies from the description and figures given in Hudson and Gosse,

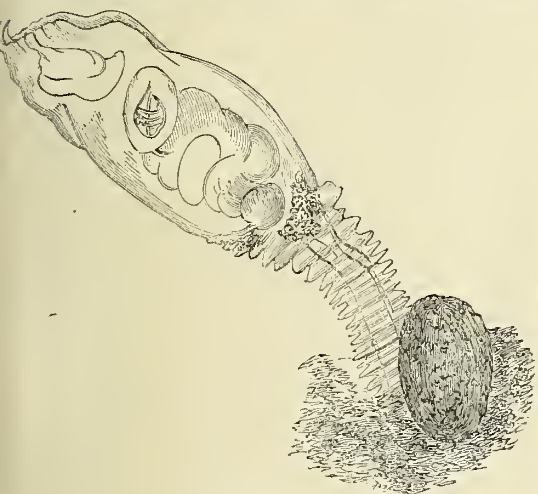

Fig. 78.—Œcistes, contracted.

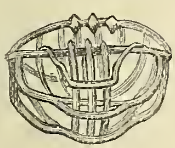

Fig. 79.—Trophi.

Fig. 80.—Corona.

viz., in the corona being reniform, the foot shorter, tapering, more deeply and less regularly wrinkled, and in its quiet habits. Neither does it agree with the same author's meagre account of *Œ. ptygura*, as it certainly has a ventral antenna. It must come very close to these two, but not being able to satisfactorily determine which it is, I am induced to send my drawing and notes to this widely read paper, in the hope that some gentleman better versed in the subject will be able to name it, or decide if it is a new species.

Ernest H. Tugwell.

Greenwich.

THE DEVELOPMENT OF THE COLOURS OF FLOWERS THROUGH INSECT SELECTION.

THERE runs an old proverb that tells us that, "He who proves too much proves nothing;" one that forcibly recurred to my mind as I read Mr. A. G. Tansley's not unfair comments upon my paper anent the development of the colours of flowers theory.

Certain it is that, although he might fail to bring conviction to my mind, if the establishment of the theory depended upon his staunch and able advocacy, he would, at least, win many to concurrence in his views. Without going seriatim into these comments, let me observe that, stripped of the verbiage and technical phrases which too often encumber the argument, it may manifestly be reduced to the simple proposition that primitive flowers were colourless, but that, through the selection of insects, they have gradually acquired their present brilliant colours. On the other hand, those not of this way of thinking say, Not so, when we look around us we see that from the germination of the seed, through every stage of the plant's growth—through its period of flowering—and on to its production of mature seed *colour* is secreted. Sometimes either the upper or the under side of the leaves, sometimes both, are richly and permanently coloured, these colours being often symmetrically disposed, as in the case of flowers; nor can it be said that these bright colours are the attributes of a period of decay. Often it is the young leaves or shoots alone, these latter colours being more or less evanescent, and ultimately assuming the tints of the parent stem and branch. Then, again, we see the flowers of every attractive hue, and, further on, the seeds often not a whit less beautiful, sometimes even more so than the petals of the flowers which produced them. Nor does the secretion of pigments cease with growth-reproduction, for it is seen also in the "red leaf." Both in life and in death.

Now whether we consider the whole period from the germination of the old seed to the perfecting of the new, a single process or a series of connected processes, matters not; 'tis throughout continuous, nor can we say that at any particular point the process is interrupted.

Why then, it may be asked, why when the secretion of pigments by plants is so universal should the coloration from the beginning of the plant's life up to its floral stage, and its further progress from fertilization be recognised as chemical, or what not, and yet the intermediate period—that of flowering—be so arbitrarily excluded and, notwithstanding the continuity of the process, be regarded as a period entirely independent of that which precedes and also of that which succeeds it?

The answer is given by the selectionist who has discovered, or who thinks that he has discovered the *use* of these flower colours, and who argues that, assuming the benefits of cross-fertilization, which is brought about mainly by the aid of insects, these pigments "have a physiological significance of their own," because their function is to attract these insects, and although both plants and seeds too have their functions these do not *need* colours, that is to say, we have not yet discovered *their* use, and, therefore, they must be incidental, &c.*

Now herein lies the pith of the whole argument. My contention is, that it is *not* the function, *i.e.* not the *sole* function of the colours of flowers to attract insects; to my mind they have a higher function than this, 'tis that of ministering to the happiness of man, by gratifying that sense of beauty with which he has been endowed.

I readily, however, admit that they may be *useful* in thus attracting insects; "these creatures *incidentally* performing an office in the reproductive economy." Nay, I may even go further and say that, for aught we know, in many instances bright-hued flowers may be a source of pleasure to the animated atoms frequenting them. Specialised or not, however, it in no wise proves that all primitive flowers were of necessity colourless; on the contrary it will, I venture to think, be more reasonable to conclude that, seeing the advantage derived by them from their bright hues, they were, many of them, *originally* brightly coloured, and not, as the selectionists assume, colourless.

Now if *all*, or a large proportion of flowers were now beautifully coloured, if *all* were monœcious, and if all were *insect-loved*, then it might most reasonably be assumed that their sole function was to attract insects. But it is far otherwise, for innumerable flowers visited by insects are not conspicuous for their bright colours, do not occur sexually distinct; and a vast proportion being self-fertilizing or anemophilous, need not the services of insects at all, many of these latter yet being brilliantly coloured, so that, indeed, there seems to be no rule as to colour. The fact that "insects visit numbers of flowers solely for the sake of the pollen," of which fact I am not, of course, ignorant, in no wise helps the selection theory, inasmuch as that although such plants are visited by pollen-gatherers, they may yet be, and very generally are fertilized by other means; that is to say, they are not *dependent* upon insects for fertilization.

Mr. Tansley himself admits that originally the pigments of flowers, which are elsewhere asserted to have been non-existent, were merely "incidental products of physiological processes," but in effect says that these have *now* become *essential.* If not essential once, why should they be so now? (An answer from the selectionist's point of view appears elsewhere.)

Mr. Tansley says that "the colours of flowers could have no function before entomophily became general," and that, therefore, their existence was an "evolutionary impossibility." What then of the colours of plants and seeds? 'Tis not contended that *they* were once non-existent.

I cannot help thinking that here, in speaking of colour, Mr. Tansley falls into the error of speaking rather of the quality or property of a thing, as apart from the thing itself. 'Tis not a single quality, 'tis the several qualities or properties pertaining to the thing that constitute its real significance.

As regards flowers, it is very questionable whether if they were never so brilliantly coloured they would be visited by insects, which are attracted not by the colours alone, but also by sweet odours, pollen and honey—mostly by the last; consequently we find that where honey is absent even beautiful-hued flowers are comparatively neglected—if we except those visited by pollen-gatherers, a mere handful compared with those attracted either by honey alone or associated with pollen. Take, for instance, the host of lepidoptera, many of the hymenoptera and diptera that visit flowers solely for their honey. No, 'tis *one* of the functions of *flowers* to attract insects, not the sole function of their *colours.* Could we penetrate more deeply into nature's secrets we should probably discover that the colours of plants and seeds are just as much concerned in physiological processes as are the colours of flowers. Both plant and seed, too, have their function. Is it not as much the function of the plant to *begin* the process of reproduction as it is for the flower to *carry it on?* Within the unfolded flower-bud is there not stored up the as yet unfertilized seed? Are not physiological processes involved in the production of the flower from the plant, and of the fruit and seed from the flower, and have they not equally "a physiological significance of their own"?

Perfectly aware am I of the fact that at one time phanerogamous plants did not exist. I am also aware that it is asserted that "among plants there are numerous cases in which flowers once specially adapted to be fertilized by insects have lost their gay corolla and their special adaptations, and have become degraded into wind-fertilized forms." Now, whether produced by a special creative fiat, as once believed, or whether, as is more in accord with evolutionary views, by a gradual process of evolution from humble cryptogams, is not material to our argument. Thus much we do know—that at near the close of the tertiary period not only *dicotyledonous* trees formed extensive forests, but that plants belonging to the *Primulaceæ*, *Scrophulariaceæ*, *Crassulaceæ*, and other existing orders abounded, and that azaleas, ericas, honeysuckles, rhododendrons, &c., garnished the earth with beauty as at the present day. Now as these plants were many of them specifically allied to existing forms, the colours were presumably as varied.

Even allowing that phanerogams were evolved from

* Speaking of the general colour relations of plants, Mr. Wallace says that "These all belong to the class of intrinsic or normal colours, due to the chemical constitution of the organism; as colours they are unadaptive, and appear to have no more relation to the well-being of the plants themselves than do the colours of gems and minerals," adding, further on, page 304, "It is when we come to the essential parts of plants on which their perpetuation and distribution depend that we find colour largely *utilised* for a distinct purpose in flowers and fruit." "Darwinism," Macmillan, 1889.

cryptogams, many of these latter must undoubtedly have been coloured as at present; and it is surely a fair assumption that phanerogams partook of their colours, and, further, the flowers, however rudimentary—being but stunted branches—almost certainly partook of the colours of the young leaves or branches producing them. Is this an unreasonable assumption —much less an "evolutionary impossibility"?

But then, the selectionist may say again that primitive flowers were to begin with hermaphrodite or anemophilous, and needed not the office of insects for their fecundation; this arrangement, however, being disadvantageous to the plants, male and female organs were ultimately produced separately, and so, to ensure fertilization, the aid of insects was called in, and to ensure *their* visits brilliant *colours* must be—or at least were—produced to attract them. That is to say, *they* produced the colours to attract themselves. This appears to be the line of argument.

As things now exist we may certainly admit the advantages of cross-fertilization, but cannot fail to recognise its disadvantages too, and may even fail to see the original *necessity* for it any more than at present. This, however, I am not competent to determine, and may perhaps be excused for not wishing to follow the selectionist into all the ramifications of an admittedly intricate subject, lest I should deserve to be classed with those of whom it has been said that they rush in where angels fear to tread. Mr. Tansley will do well—if he has not already done so—to peruse the eleventh chapter of Mr. Wallace's last work,* wherein he will find the subject treated in this author's usual impartial spirit. To a mere dabbler like myself his exposition appears to be an exhaustive one, and yet this gentleman modestly denominates it "a mere outline sketch."

My remarks about the relations of long and short-tongued insects to flowers are "based upon a misconception." Does Mr. Tansley mean a misconception of the facts, or as to his interpretation of them? I cannot help thinking that if my argument is based upon a misconception, some portion at least of his is equally founded upon a misapprehension; hence, perhaps, some mutual misunderstanding.

The importation of the matter into the argument was his, not mine.

As regards the advantages and disadvantages of primitive open flowers, whilst allowing due weight to Mr. Tansley's argument, I cannot but think that the disadvantages set forth are very greatly overrated, and that the balance is in favour of open as against closed; but this is of course pure speculation.†

* "Darwinism," A. Russel Wallace.

† I do not at all object that so few species of insects have become specially adapted to particular species of flowers. What I do object to is that, seeing how few have been so adapted, the selectionist should seize upon these few instances and parade them as if they were incontrovertible evidence in favour of his theory—regardless of the fact that non-specialised flowers and insects exceed them probably by a hundred—aye, a thousand—fold.

Perhaps the term "trouble" used by me was not a particularly happy one, but one, I venture to think, that will commend itself to most ordinary readers. Those who have watched the humble-bee's struggles to gain entrance into, say, an antirrhinum will readily comprehend my use of the term.

Mr. Tansley's argument about the semi-domesticated condition of the hive-bee, and the consequent modification of its original habits, is undoubtedly entitled to some consideration. He must not, however, lose sight of the fact that most of the experiments recorded by Sir John Lubbock and others, were made with hive and not wild bees. If, therefore, my argument, based upon my own observations of these creatures' habits, is in any degree fallacious, so also is that of those who derive confirmation of their theories from experiments made upon these same under more purely artificial conditions.

I hardly know how to answer Mr. Tansley's tentative query, so modestly put forth. Let me assure him that for many past years I have had—and still have, rare facilities for observing the habits of wild—as well as hive—bees. I am now resident in one of the most lovely spots in the Cotswolds, in the midst of extensive woods, lofty hills and deep valleys —the whole neighbourhood furnishing a rich fauna and flora; and having abundant leisure, I devote it, during that period of the year when insects are active, to the study of insect and vegetable life. I cannot, however, aspire to be considered a specialist; he may, therefore, write me down a naturalist—and one, I hope, who knows how to make use of his eyes.

How purely assumptive is the opinion that insects whose tongues were becoming longer were at the same time increasing in intelligence must be apparent to every reader of SCIENCE-GOSSIP. It may, or it may not, have been so—we have, however, as much right to assume that a long-legged man is more intelligent than a short-legged; that because the neck of the giraffe so far exceeds in length that of any other ruminant, or that because the legs of the Phalangidæ, Tipulidæ, etc., are more attenuated than most other creeping and flying things, that they, too, must surpass in intelligence others of their kind. Yet we have not a tittle of evidence to support so wild a a belief; nor does it appear to me to be a legitimate conclusion that because certain organs have been specialised, to adapt them to certain conditions, that, therefore, a corresponding advance in intelligence has taken place. Have we not a right, too, to assume that the short-tongued insects were not stationary, but were also advancing towards perfection—likewise progressing in intelligence.

I cannot help taking exception to Hermann Müller's remarks—quoted by Mr. Tansley—that "insects whose bodily organisation is least adapted for a floral diet, are also least ingenious and skilful in seeking and obtaining their food." It does not clearly appear whether this remark applies to both carnivorous and omniferous insects as distinct from those adapted entirely for a floral diet. I cannot help thinking that most entomologists will agree with me when I say that, it may be taken as a general rule, that insects that have to capture their prey, exhibit greater intelligence than those who actually living upon, or within their food, need not to exercise qualities so conspicuous in insect carnivora as skill, craft, cunning, patience, etc.

Let me here consider *en masse* the several terms employed by me to which Mr. Tansley takes exception. Although they may not be the happiest I might have used, I yet think that they fully express the meaning I intended to convey. With regard to "accidental" and "designed" I mean those creatures or things *accidentally* brought together, as opposed to those associated together from the beginning. This is, primarily, the idea I meant to bring before the reader. Let me, however, add that I had in my mind at the time I penned the words the thought that there was a *purpose* in this original association, that it was not *fortuitous* but *designed*—nor do I now desire in anywise to qualify the term almost unconsciously so employed. If Mr. Tansley asks what *are* accidental adaptations, let me briefly instance the case of exotic insects through man's agency imported into a country where the indigenous flora is distinct from that of the creatures' native habitat. A large proportion of them would probably perish for want of suitable food—possibly all. Some few, however, might contrive to exist—some few even flourish upon plants differing from their natural food, *e.g.*, the well-known instance of silkworms feeding upon lettuce leaves. In many instances both animals and plants so introduced have so effectually adapted themselves to their new conditions, to the detriment of the natives, that they have not only brought about the latter's decrease, but often their actual extirpation. It cannot be said that in these instances the mutual adaptations of the introduced plants or animals are other than accidental, since the change has been brought about by no purely natural process but solely through the agency of man.

On the other hand these same creatures—say insects—in their native habitat feed upon its indigenous flora, and in process of time have become as permanently dependent upon it as it has upon their offices. Probably this mutual dependence has existed from the remotest past—plants and animals have become simultaneously developed until they have, in a sense, become part and parcel of each other, and, finally, cannot exist apart. I do not call *this* an *accidental*, but a *designed* adaptation—that is to say, that in it there is evidence of an original purpose or intention, *i.e.* design.

"Created," "meaningless"! Does Mr. Tansley mean in the sense in which I have used it—or does he altogether object to the word? I used it in the popularly understood sense. It plainly implies *purpose*, as distinguished from *fortuity*. Mr. Tansley has probably misapprehended my object.

Again, some selectionists assert that primitive flowers were colourless, but that by a process of insect selection, colours were evolved;* that in point of fact, that which once had no existence was practically by insects "*created*." I fail to see how the upholders of the theory can get away from this conclusion—it appears to me a logical one. Mr. Tansley must, however, admit that their office is one quite unconsciously performed—nor does it come within the compass of the creatures' ability to produce a single colour, and I say, that to credit them with this absolute power is to invest them with the attributes of Deity, which is manifestly absurd, and, function or no function, is not only an "evolutionary" but an utter "impossibility." This is the idea I intended to convey in my use of the term "creation."

Possibly the selectionist may here agree that of course they never intend to assert that insects cause colour to appear where absolutely none already exists —*i.e.* bring something out of nothing; they contend only for their "development"—the opening of that enveloped. Then why use such terms as "non-existent" and "colourless"? To say the least, they are misleading.

Notwithstanding my desire to avoid the introduction of theology into the discussion, Mr. Tansley's objection to my use of such terms as "designed" and "created" leads me to here remark that, however "meaningless" these terms may appear to him, there are yet very many who believe in the power of One to create, and who, although evolutionists, can yet believe that in the multifarious processes continually going on around us, and in the marvellous adaptations and relations visible in the animal and vegetable kingdoms, we can trace the evidence of purpose, intention, design; and whether by His direct interposition, or by and through the harmonious operations of His laws, these relations have been established.

I trust that I am not so much of an evolutionist as to ignore this evidence, nor so little of one that I can ignore plain facts to suit preconceived theological notions.

Then why find fault with my figure of speech—"disturbance of Nature's scheme"? The context clearly shows the sense in which it is used. It is assumed by all true naturalists that a harmony and beauty pervades all creation—that things are nicely balanced, exquisitely adjusted—that there is an appointed place for every creature in Nature, and that every creature is in that place, and in harmonious relation with those surrounding it. Whether true in

* Although the *utilization* of *already existing* colours is so frequently discussed by them, I cannot call to mind any instance in the works of either Darwin or Wallace where colour in flowers is said to have been non-existent.

point of fact or not, is not to the purpose—'tis so popularly accepted.

Now when any creatures gain an advantage over others, it is—or is supposed to be to the detriment of those less advantageously placed—the former eventually, as it were, elbowing these latter not only out of their appointed place, but often, ultimately, out of existence. The conditions of their life have become so unfavourably altered, interrupted, interfered with —*i.e. disturbed*, that in the "struggle for existence" they are vanquished. Now it certainly cannot be truly said that *this* is not a part of "Nature's scheme." Doubtless it is; nevertheless it is surely permissible to speak of this whole or partial extinguishment of a race as a "disturbance" of a harmonious scheme, whether brought about by the gradual changes indicated, or whether by cataclysms involving the annihilation not of a single race, but of whole races of beings. Are not the hurricane and the earthquake parts of Nature's scheme as much as the oft-unbroken calm which precedes and follows them? Yet they are commonly regarded and actually spoken of as *disturbances* of Nature.

But there, I need scarcely go further than Mr. Tansley's own papers, which abound in terms and phrases to which, if captiously inclined, I might take exception.

NOTE ON THE DISCOVERY OF SOME RIVER-DRIFT IMPLEMENTS AT WEST WICKHAM, KENT.*

By George Clinch.

THE age when flint implements were looked upon as the handiwork of elves and fairies has happily passed for ever away, and it is pleasant to find that the suspicion and distrust with which they were generally regarded, even in these latter days, has, to a considerable extent, died out. Therefore, in discoursing upon certain wrought flints which I have found lately in my own parish, I do not anticipate that I shall be considered by my readers to partake of the character of either a wizard or a dissembler.

In the parish of West Wickham, near to Hayes Common, there is a field called Church Field; and through that field there runs a small valley; on the sides of this valley there are patches of stiff ochreous clay, and in this clay were found the flint implements to which I desire to draw attention. Although no river or stream now runs through this valley, yet it is quite clear that at some far distant time it had some relation to the basin of the river Ravensbourne. Indeed, the connection can easily be traced by any one who follows the bottom of the dry valleys out to Bromley, where of course the junction with the Ravensbourne takes place. Commencing at Church Field, the valley after passing through two or three fields, opens at right angles into a larger valley, known in this place by the name of "Gates Green" (a significant name). The Gates Green valley bounds Hayes Common on its southern and western sides, and after taking a gently curving sweep from Gates Green to Coney Hall (where it is joined by the Addington valley, in which there is a small stream known as the "Bone" or "Bourne") it keeps a tolerably uniform course to Bromley. There, at a place called Hayes Ford, the Bourne joins the Ravensbourne, and the two valleys may be considered to have become one.

Without entering into details, the outline of the geological character of the little valley in Church Field seems to be this: By some means the valley was first cut through, perhaps, some twenty feet of tertiary strata into the underlying chalk. The valley bottom was then partially filled up with various *débris* in which cretaceous and tertiary fragments were indiscriminately commingled. Thus, the chalk is much hidden from view, except in some instances upon the brow of a hill, where the *débris* may not have been deposited. It is not found upon the highest ground, this being capped with tertiary strata, neither is it found in the bottom of the valley (except in the form of re-deposited chalk), this being invariably occupied by *débris*. The patches of drift clay or gravel upon the sides of the valley are comparatively, only superficial, and are among the last deposits which the valley has received.

But let us now pass on to the flint implements themselves, which I have found here at various times during the past two years. They present the true characteristics of drift implements of which so many admirable examples are engraved in Dr. J. Evans' "Ancient Stone Implements of Britain," and Sir John Lubbock's "Prehistoric Times," and other works upon that subject. They are nearly all stained a bright ochreous yellow colour, whilst a few have retained a dark but highly glazed surface. The angles and edges of some show considerable marks of wear, but this abrasion is found only upon the angles and ridges and is not to be found in the hollows and depressions of the conchoidal fractures. This shows that the abrasion did not arise from the action of sand and waves upon a sea-beach, but was due to contact with large stones and just such other forces as we may suppose would be in operation in floods, inundations, and strong river currents. But there are some of the implements which do not bear any marks of wear at all. These are not the neolithic or surface flints, but they resemble in every other respect those flints which are of unquestionable river-drift character. The teaching of these seems to be that during at least the later periods of flood there was an area of habitable land in the immediate vicinity,

* The illustrations to this Paper will be given, with its conclusion, in our next number.

and here men resided and made their implements of flint. It is worthy of note that upon the high ground, about thirty feet above the level of this deposit of drift implements, I have found a well-chipped hatchet stained a deep yellow colour, with the fractures remarkably well-defined and clear. This most certainly has never been exposed to the wearing influences which have marked some of the Church Field specimens.

Although it is impossible in every instance to say to what uses certain forms of flint implements were put, yet it may be well to give a rough idea of their general character in the following analysis:—

Description or class.	Number.
Hatchets and almond-shaped weapons	20
Scrapers and trimmed flakes	34
Flakes	50
Miscellaneous	20
Total	124

It has been pointed out that river-drift implements may represent for the most part the *out-door* instruments of palæolithic man,* whilst his smaller and domestic articles may be represented by the contents of certain flint implement-bearing deposits of caves and rock-shelters. This is very evident when we remember that he usually selected a cave or other natural shelter for his dwelling-place. As far as I am aware, no natural shelter, other than that which might be afforded by vegetation, is to be found in the neighbourhood of Church Field; yet, as we find sharp-edged flakes and domestic implements such as scrapers, it is very clear that he must have lived somewhere close by. It seems not improbable that there may have been a small growth of hardy coniferous or other trees near at hand out of which he may have made some house or hut, rude and clumsy no doubt, yet sufficient for the shelter of himself and his family from the frost and snow of the long palæolithic winters. When we remember the wonderful way in which the Esquimaux make for themselves houses of snow-blocks, we cannot doubt that palæolithic man found means of making for himself some kind of shelter even where none naturally existed.

(*To be concluded.*)

A WALK IN EAST SUSSEX.

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

IT was a fine morning in August, and the plan had already been formed, to make a botanizing tour right across the eastern portion of this interesting county. The place of departure was the pretty village of Sedlescomb, six miles due north of Hastings, and the destination was Hurstmonceux. An early breakfast over, the walk was commenced about nine o'clock, the impedimenta being a schoolboy's bag, with an old volume in it to receive specimens of plants, and a tin box containing sundry bottles, pill boxes, and other requisites for any captures or geological specimens that might fall to one's lot. The lanes as far as Whatlington (or Wartlington) were beautified with sundry composites, umbels, and other plants, including the hemp agrimony, knapweeds, scabious and golden-rod. This latter was profuse, and its parasite (*Puccinia virgaureæ*) infested nearly every plant. Near the village school at Sedlescomb a rich show of vervain adorned the bank, and at the railway crossing below Vinehall a glorious clump of this Simpler's joy reared its spikes of purple bloom. It was not seen again afterwards. Between Whatlington and Vinehall the wall lettuce is abundant, and the delicate white-flowered variety of herb Robert or stinking cranesbill is found. The road from Vinehall lay across a park and through by-paths, fields and woods to Netherfield. Many were the beautiful flowers one passed at every step. Among the rarer were the blue flax, abundant in the part, with hairbells, yellow hawkweeds, and lotus; the viscid bartsia (*Eufragia viscosa*) the sight of which for the first time in my life, made the heart dance for joy; the rarer buckthorn (*Rhamnus frangula*) which, I believe, was largely employed in olden times at Battle, in the manufacture of gunpowder; the beautiful tutsan (*Hypericum androsæmum*), whose leaves, fragrant when dry, were covered with rust (*Uredo hypericorum*), and various fungi, mosses and other interesting cryptogams too numerous to mention. Netherfield church was reached shortly after eleven o'clock, and a détour made towards Mountfield, for the purpose of visiting the famous Wealden Boring, now better known among the natives as the 'Gyptian Works, because of the existence there of a profitable gypsum-mine and factory. One could have spent hours on the common, with its heather and bracken, and fair command of rich woodland in every direction; and the entomological tastes which we found in existence, craved for an opportunity of obtaining satisfaction. But one had to be content with gathering the sow-thistle rust (*Coleosporium sonchi-arvensis*), so abundant here on the yellow star-thistle, and a fragment of one of the rare Anchuseæ, which had been robbed of all its rich blossoms, by ruthless hands, and looked very disconsolate over its loss.

The gypsum works are full of interest, both historically aud geologically. The courteous manager showed me over the whole, save that the dinner-hour being so near, prevented me going down the shaft. The various qualities were pointed out; specimens of the raw, burnt, refined, mixed, dry, and tested materials given me; and a hearty invitation to dinner extended. This it was necessary to decline, though it was reluctantly done, as the shaft and workings might

* *Vide* Dr. John Evans' "Ancient Stone Implements of Great Britain,' p. 427.

have been afterwards examined. Such a delay, however, would have prevented the carrying out of well-laid plans; so the oyster slab was examined, which a thoughtful geologist has put aside for the enlightenment and profit of his brethren, the teasel, spindle-tree, toad-flax, centaury, and other interesting flowers noted, and "good-bye" said to our friend, who came some distance through the wood to put us on the track. The lily of the valley occurs near here, with some other rare plants, one of which was soon found in the hedgerows, on the high road between Netherfield and Darvel Hole. The wild medlar (*Mespilus germanicus*) is plentiful here, with its typical spines, which disappear in the cultivated plant; and not only was it in full fruit, but we received a present of the lacerated clustercup (*Rœstelia lacerata*) which had been found on its leaves. The checker or wild service-tree (*Pyrus torminalis*) is also common here, but this year it was very difficult to procure fruiting specimens, nearly every tree being barren. In the hedges the common cow-wheat was most profuse, and a beautiful albino specimen of Erythrœa rewarded our search. The walk was continued from Darvel Hole by the high road to Dallington. In the forest here the gentian (*G. pneumonanthe*), whortleberry, heath, sundew (*D. rotundifolia*), bog-violet and other rich plants occur, and no botanist ought to visit this part of the country without spending a day between Heathfield and Dallington or Brightling.

From Dallington the route lay through Three Cups to Heathfield Chapel, where are some boggy spots famous for their plants. The bog asphodel, sundew, buckbean and other plants are here recorded, but as evening was coming on apace, the road to Warbleton Church was taken, in the hope of finding the moonwort fern. The search, however, proved unsuccessful. On the heath, and by the road to Horsham, the beautiful dodder was found, while the alternate water-milfoil (*Myriophyllum alterniflorum*), tansy, and other plants, including the pretty strawberry clover, were among our spoils. A short ride from Horsham to Hailsham broke the journey, then a walk of four miles brought me to Hurstmonceux. Here the thorn-apple (*Datura*) was found in its usual semi-wild state, while the frog-bit (*Hydrocharis*), the wood-spurge, the annual dogs-mercury, the sweet-briar among phænogams, and the plum-tree brand, bean-rust, various mosses and lichens among cryptogams, closed our list. It will be seen that the "finds" were not by any means despicable. The country traversed was delightful, the weather all that could be desired, while the enjoyment was enhanced by pleasant recollections of happy days spent up and down the district, in nearly every village and hamlet through which I passed, in the auld lang syne. Though there are few inns or resting-places, the people are exceedingly hospitable, and fortunately have not been spoiled by multitudes of tourists. I heartily commend the district to my brother naturalists.

FAMILY CARES.

By a Green Lizard.

I SUPPOSE because I am fatter and bigger, more vigorous in fact than madame or the youngsters, that I feel before them the approach of spring. The thaw has come—an old mole is at work beneath us—and he always knows when the change is coming—I feel more supple, and able to shake off lethargic sleep—the sun must be shining outside; I shall give the little ones a crack on the back with my tail, and be off for a look round.

It was real cold when we shut up, but I have little memory of the past winter: deep sleep in a snug, warm nest quickly drowns dull care; we are conscious of nothing till I rouse up in the spring. In late autumn I worked hard in scraping out more extended winter-quarters; made my claws beastly sore in fact, the old woman could not help much; she was taken up with the six kids. I was late in carrying in moss to line our beds for increased numbers—the additional family was larger than we anticipated. The missus basks on sunny banks in the hotter part of the summer days to thoroughly incubate the eggs thereby. She's not *quite* viviparous—I wish she was; would save time in autumn when the little beggars have to be taught to crawl and run, to catch flies and insects; they are slow in food-catching at first—can't use the tongue properly—afterwards it is all the other way on; they will eat to repletion, and try to swallow anything that moves, however big it may be. But there, lizards must learn. When young, I well remember trying to swallow a gigantic snail because he moved; the edge of the shell cut my tongue—I suffered pain, but learnt prudence and discrimination. But we look to the time from their birth to the winter to complete all necessary education, and the time is very short—barely two months; and I am always late in excavating the winter's home—for we must change our quarters sometimes. How my claws do get torn! It is not enough to enlarge a hole in the chinks of a wall—blundering fools called men pull them down in pure wantonness—to be safe I must burrow beneath the soil. I generally start through a wall or heap of stones, to put folks off the track. Deep down we are safe. It's a mercy we don't require food in winter; of course we should starve if we could not sleep in such a dense torpor. Strange how the feeling creeps on one. Directly cold approaches we lose sensation; the blood ceases to circulate rapidly; we lose all control. Those little chaps, again, want experience; they will stay out in the thin rays of wintry sun, the languid state overtakes them suddenly, and they cannot move. One of them was captured last year, but he escaped—minus his tail. Now this is a common but most vexatious loss; it takes a deal of re-growing. We crawl in together to the moss-lined nest; the old lady curls round with the tip of her tail in her mouth, and goes right off asleep like a church; the young ones crowd in all of a heap, and I wriggle round the lot. They worrit about a bit, but are soon still. For five months all is blank. Once, indeed, I was caught by a fat man. I just knew something was moving; but he did as he liked with my head, feet, and arms; I had no fear or power of resistance. I *do* remember, and resent it bitterly, finding myself unpleasantly hot on the kitchen hob; the wretch had thawed me. It was close on spring-time. I escaped, and found another hole to dwell in, and later on captured another wife; I don't know if I was really free, but we lizards don't think so much of this point; the old 'un was a bit of a vixen, and I've been more comfortable since the change.

SOME SIAMESE FRUITS.

THE fruits peculiar to the peninsulas and islands of Malay Land are so wholly unknown in England even by name, except to those familiar with the writings of the few naturalists who have visited the Archipelago, that some description of the Indo-Malayan (and therefore Siamese) fruits may not be without the interest of novelty.

If this article were to be taken as a description of the chief fruits of Siam, it might be thought that from this corner of Asia the banana and mango, so well known in India, were singularly absent. But I write now in the midst of a great fruit-plantation just outside Bangkok, and here the long, drooping finger-leaves of the mango-tree and the great broad leaves of the banana, now sadly ribboned by past storms, are only less prominent than the stately areca-palm which towers over all.

But we must confine our attention to the fruits that are now within my reach, and refrain from the temptation to dilate on favourite absentees.

Of the seven fruits in the group only three are quite peculiar to Malay Land; these shall be described first. The fourth and fifth are Asiatic fruits, but have a wide tropical range; and the last two are of American origin, long cultivated in Asia.

(1.) Number one shall be the "king of fruits," the famous Durian, about which Wallace says that "to eat durians is a new sensation worth a voyage to the East to experience." Indeed, Wallace's description of the durian is so complete and so appreciative that I cannot do better than advise you to supplement my necessarily brief account of this marvellous fruit by reading what he says about it in Chapter V. of "The Malay Archipelago." In the illustration two durians hang from the branch on which they have grown, fitly surmounting the whole group, and easily distinguished by their long sharp spines and exterior markings of the five divisions of the carpels, over which the spines arch slightly. So strong and sharp are the durian spines that it is almost impossible to lift the fruit off the ground if the stalk has been broken off. When the ripe fruit falls from the lofty tree on which it grows, it is certain to inflict serious injury on any unfortunate creature who may happen to be immediately below. The blow given by the huge fruit is itself very severe, and the spines tear the flesh terribly. So that "trees and fruits do not appear to be organised with exclusive reference to the use and convenience of man;" otherwise, why doesn't the durian grow on a low tree like the jack-fruit?

Opinions of travellers are divided into two distinct classes as to the merits of the durian. The enthusiastic encomiums of Wallace will seem strangely contradicted by the strongly-expressed aversion of men who have traded and travelled but not lived in Durian-land. The fact is that the king of fruits has, unfortunately, an extremely disagreeable odour, "like onions in a state of putrefaction," which makes its presence indoors an intolerable nuisance, so that those who do not know the secret about durian-eating, never get further than reviling the odour. The only way to overcome the first repugnance is to eat durian out of doors at the foot of the tree from which it has just fallen, for even an hour's delay spoils the exquisite flavour—a flavour so truly "indescribable," that "a rich butter-like custard, highly flavoured with almonds," "cream-cheese," "onion-sauce," "brown sherry," are among the "incongruities" of which it reminds one.

The Siamese call this fruit the "Too reean," and as "reean" means also "to learn," there may be some humorous reference to the necessity of an education in durian-eating; but the Siamese are so rarely humorous that this is probably a mere linguistic coincidence.

The botanists, or at least the few whose works I am able to consult, seem undecided as to the place *Durio zibethinus* shall occupy in the great families of plants, whether it shall be regarded as a member of the tribe Bombaceæ in the order Malvaceæ, or whether Bombaceæ shall be elevated to the rank of a separate order. But as very few of the ordinary text-books mention the durian at all, it is not much use trying to settle the matter at present.

(2.) Of the Malayan Mangosteen no one says anything but praise. It has no unpleasant odour, is of conveniently small size, and of most luscious flavour. The "Pride of the Malays" is a title accorded to it which bears evidence to the good taste of even rice-eating Malays. In size and shape it is like a small apple or orange, but in exterior colouring and interior arrangement far different. Its rind is of dark mahogany colour, and is so hard and leathery that it requires a very strong hand and sharp knife to cut it. Oriental servants usually slit the rind midway all round before sending the fruit to table, then the upper half can be lifted off and the edible fruit exposed. The decussate pairs of thick, leathery sepals, and the closely-appressed stigmas can be readily seen on looking at a good mangosteen.

When the upper half of the rind is taken off the fruit, a sight of beauty meets the eyes, and, after the first experience of the taste of this delicious fruit, makes the mouth water. A deeply-sectioned pulp of dazzling whiteness lies in its dark-brown cup, inside the margin of which there is usually a layer of deep golden gamboge. The pulp is more deeply lobed exteriorly than in the orange, the number of lobes varying between five and eight. It is a favourite trick of Europeans in the East to ask new-comers to guess how many sections of white pulp there will be when the fruit is opened. As the number is indicated by the flattened stigmas outside, any one with a mere smattering of botanical knowledge has no hesitation in stating a number which is always correct, much to the amazement of the uninitiated. No words can do justice to the exquisite flavour of this rich glutinous pulp. The fruit is perfectly harmless, and any quantity can be consumed at tiffin with impunity. Europeans always bar fruit after mid-day, thinking it unsafe.

The gamboge of the mangosteen is found in other members of the same family in such abundance that this product gives the name to the whole order—Gulliferæ. The mangosteen, *Garcinia mangostana*, so named after the traveller Dr. Garcin, does not yield enough of the pigment to make it worth extracting, but *Garcinia morella* is the source of the cake-gamboge or camboge of Siam, the best in the world. To obtain the pigment the leaves and young twigs of suitable trees are crushed, and the resinous gum collected in much the same way as it is now proposed to obtain gutta percha from *Isonandra dychopsis*. Gamboge is chiefly valuable commercially as a pigment, but it is also employed medicinally for its purgative properties. It is curious that the mangosteen also contains an astringent medicine in the tannin of the leathery-looking rind, which is used in cases of dysentery and as a gargle in throat disorders. The tree on which the mangosteen grows has beautiful glossy leaves like those of the citron-tree, and is altogether so highly ornamental that it is cultivated in the Batavia gardens for its appearance as much as its fruit. Efforts to naturalise the mangosteen in India have hitherto failed, and there seems little hope of this trophy of the Moluccas ever becoming widely known.

(3.) The little-known Rambutans mentioned by Wallace in his remarkable list of the fruits found in Borneo are small burr-like fruits. The Litchi and Lougan are delicious fruits of the same family (Sapindaceæ) well-known in India, but I cannot ascertain that the rambutan is naturalised further west than the Malay Peninsula. The Siamese name of this little fruit is as repellent as its horny exterior; the syllable "ngau" most nearly represents the sound, but a European need never hope to master these unutterable nasals. When the rough coat is removed, the small round fruit looks like an egg whose albumen is stiffened but not made opaque in the stiffening, perhaps the semi-transparent white of raw onion laminæ most nearly resembles the rambutan in colour and consistence. In the centre of the pulp is one large stone which the Siamese scoop out at one end with a kind of tweezers, leaving the cylinder of edible fruit unbroken. The flavour is sweet and pleasant, and the abundant juice very refreshing.

(4.) The huge Jack-fruit is so well known in India and so far inferior as a fruit to the others in the group that scant notice may suffice. The enormous size of the fruit is the result of the coalescence of many pistillate flowers—perianths, carpels, and receptacles all being absorbed and swollen out of recognition, and finally forming a mass weighing as much as sixty pounds. When one small tree is laden with three or four of these great yellow spine-covered masses, one is forced to marvel although one can't admire. The jack-fruit is not a thing of beauty, and its flavour, like that of "mashed potatoes," is far inferior to the flavour of the bread-fruit of the Oceanic Islands far east. It is curious that the bread-fruit (*Artocarpus incisa*), and the jack-fruit (*Artocarpus integrifolia*), both edible and highly nutritive, should belong to the same order (Artocarpaceæ) as the deadly upas-tree of Java, whose resinous juice is a virulent poison.

Although the jack is rather a failure as a fruit, it is good enough as a vegetable, and makes capital fritters and puddings. The still more valuable bread-fruit may yet be transplanted to the West Indies—unfortunately the seeds become abortive by cultivation—and there grown, as Wallace suggests, for the Covent Garden Market.

(5.) The Shaddock, otherwise the Pompelmousse or Pommelo, is only an orange of larger bulk and less regular shape. South-eastern Asia was the ancestral home of all the oranges, and yet boasts of a greater variety of these beautiful, glossy-leaved, golden-fruited trees than any other part of the world. Here in this fruit-garden are orange-trees of many kinds, from the pretty garden shrub whose pinnate leaves are of that vivid green young Siamese dandies affect for their panungs, and whose lovely white flowers are provokingly frail, to great trees only slightly inferior in height to the graceful areca palm.

In colour both of rind and pulp the Shaddock resembles the lemon rather than the common orange; and its flavour is too sweet to be as pleasing to European taste as the refreshing acidity of the oranges of Southern Europe. With judicious grafting and cultivation much improvement might be effected, and the Shaddock might yet become a right royal fruit worthy to be the durian's "Queen."

(6.) Of the two American fruits least known in Europe, and therefore the most interesting in the present connection, is the Papaw, or *Carica papaya*, the chief member of its family, Papayaceæ. The Malakaw, as the Siamese call it, is grown in almost every garden round Bangkok, and the very tropical appearance of the whole tree is sure to arrest the attention of the new-comer. Its straight palm-like stem is rarely more than twenty feet high; there are no branches, only the scars of fallen leaves. The long-stalked, much-dissected leaves remaining stand out singly from the upper part of the stem; under their shadow are clusters of waxy white flowers, or of large pear-like fruits clinging close round the stem. As the fruit hangs on the tree, the exterior markings of the cell-divisions can be easily seen, but nothing prepares one for the wonder of the opened fruit. When fully ripe the green coat turns yellow and the fruit is as large as an unhusked cocoa-nut. Cut midway across with a sharp knife, a very remarkable and beautiful arrangement presents itself. Inside the soft rind is a circle, over an inch wide, of deep golden pulp, much the same in colour and consistence as that of a good mango, and in the centre is a pentagonal hollow big enough to hold an ordinary orange, and with its five sides completely covered with grey moist seeds, attached by a cord to the nourishing matrix of yellow pulp. One glance at such a fruit as this would at once dispel from the minds of young botanists all haziness as to the meaning of the "parietal placentæ" and "absorbed dissepiments" of their text-books. Here the five cell-walls have completely disappeared, and only the markings on the inside and outside of the rind are left to tell the tale. Sometimes only three or four cells are indicated, but five is the normal number, as the flowers are pentamerous. When the seed is examined, it is found that the grey colour is the result of a perfectly black seed being covered with a semi-transparent membranous coat. The unripe malakaw makes a good vegetable; the ripe fruit is not unlike mango, with the same sickly sweetness. The natives here say that tough meat becomes tender if wrapt in the malakaw leaf. There is no question about the saponaceous quality of the leaves, and a cosmetic is made from the juice.

(7.) The pineapple is so well known in England, both as an import from the West Indies and as a home growth, that it is unnecessary to describe its peculiar botanical arrangement, about which all the text-books say quite enough.

The pineapple, like many another plant of American origin, has probably been introduced into Malaysia by way of the Philippines, in the days when the Portuguese were the masters of the traffic between America and Malaysia and owners of many forts on island and mainland. The pineapple thrives so well in the southern part of the Malay Peninsula that a very important branch of trade has sprung up in Singapore in the preserving and canning of this delicious fruit. Europeans in the East, ever in dread of gastric disorders, are somewhat afraid of the pineapple, the hard white fibrous portions, and even the fibres of the juicy pulp, being a fertile source of trouble.

Not one of these seven fruits is at all good eating in its wild state. All have doubtless been under some sort of cultivation here or in their native soil for many centuries, and their present lusciousness is the result largely of this cultivation. In the matter of wild fruits, as of wild flowers, the tropics are far behind our own gloomy-skyed island in the West. There is nothing here to compare with the wild raspberries, strawberries, nuts, hips and haws of English woods; as there is nothing to compare with the daisies and buttercups, primroses and anemones, daffodils and briar-roses. Magnificent flowers are sometimes met with, wonderful fruits are doubtless frequent; but for the widespread glory of English wild flowers and the abundant variety of English wild fruits the monotonous green of the tropics is after all a poor return. But let the master, Wallace, speak on this point also.

To help to make the durian and mangosteen known at least by name and brief description to the fruit-loving people of England, and to further widen the opportunities for bringing all good things within the reach of the appreciative, may be one small link in the lengthening, strengthening chain binding East and West together.

K. GRINDROD.

Bangkok, Siam.

NATURAL AGE OF GRASSES.

IT is very interesting to learn how long these plants, the most valuable order of the vegetable kingdom, naturally live. From a careful study, extending over several years now, I conclude that few plants which are growing under suitable conditions go beyond five or six years. In order to make myself clear upon suitable conditions, I refer to perennial grasses which have fibrous roots and which are growing in a moderately suitable climate. I believe that a large number of the species which have either bulbs or creepers are merely perpetuated forms of species which under suitable conditions have only fibrous roots, or even might, in some cases, if brought to suitable conditions, turn out to be fibrous-rooted, or the seed produce fibrous-rooted plants. The varying forms of the roots of Timothy grass (*Phleum pratense*) form a good example of this—as they form bulbs readily upon dry soil.

Assuming that bulbs and creepers are appendages which enable grasses to develope under conditions where they could not do so with fibrous roots or in cases where such is the case; as, for example, tall, oat-like grass (*Arrhenatherum avenaceum*, var. *bulbosum*), forms a disagreeable weed on cultivated fields and might live to any age under these conditions; while the fibrous-rooted plant, which I believe to be the only species of the genus, would only exist for a few years.

Of those having creepers I will give the example of reed canary-grass (*Phalaris arundinacea*), which I have growing alongside several others upon dry soil, the natural habitat of this one being wet soil. I found that it required some years before it produced flowers. During that time its energies were devoted to forming these creepers, which are quite a network in the soil; but the result is that the plants of this plot practically remain alive and vigorous. While on the other plots alongside where I have,—or had, I should say,—a general representation of grasses, those with fibrous roots are mostly dead.

WILLIAM WILSON.

Alford, Aberdeen, N.B.

SCIENCE-GOSSIP.

ARION CELTICUS.—In the recently-issued Abstract of the Proceedings of the South London Entom. and N. Hist. Society for 1890–1891, p. 106, I am stated to have exhibited *Arion celticus* from Rivarrosa, Piedmont. It was *A. alpinus* that came from Rivarrosa, and the *A. celticus* were from Brest. It is a small matter, but I ask you to allow me to correct it in your columns; as an erroneous record, if not at once corrected, may give rise to trouble afterwards. —*T. D. A. Cockerell, Kingston, Jamaica.*

THE "Proceedings of the Royal Society of New South Wales" is to hand. This is a particularly good volume, containing over four hundred pages with scarce an uninteresting one among them. The contents are as follows: President's Address, H. C. Russell; "On the Importance and Nature of the Oceanic Languages," S. H. Ray; "On Certain Geometrical Operations," part i., illustrated, G. Fleuri; "A Determination of the Magnetic Elements at the Physical Laboratory, University of Sydney," illustrated, C. Coleridge Farr; "Analyses of some of the Well, Spring, Mineral, and Artesian Waters of New South Wales, and their Probable Value for Irrigation and other Purposes," illustrated, J. C. H. Mingaye; "Sewage of Country Towns: The Separate System," J. A. Thompson; "Ventilation of Sewers and Drains," illustrated, J. M. Smail; "Flying-machine Work, and the one-sixth I.H.P. Steam Motor, weighing 3¾ lbs.," illustrated, L. Hargrave; "On a New Blowpipe Arrangement," W. H. Hamlet; "On the Effect which Settlement in Australia has produced upon Indigenous Vegetation," A. G. Hamilton; "The Venom of the Australian Black Snake," C. J. Martin; "Some Folk-songs and Myths from Samoa," Rev. J. Pratt and J. Fraser; "Preliminary Notes on Limestone occurring near Sydney," H. S. Smith; "Observations on Shell Heaps and Shell Beds," illustrated, E. J. Stratham; "Hail Storms," illustrated, H. C. Russell; "Notes on the Recent Cholera Epidemic in Germany," B. Schwartzbach; "On Native Copper Iodide and other Minerals from Broken Hill, N. S. Wales," C. W. Marsh; "On the Comet in the Constellation Andromeda," J. Tebbutt; "Results of Wolf's Comet, etc.," J. Tebbutt; "On the Languages of Oceania," J. Fraser; "Notes on the Occurrence of Platinum, Gold, and Tin in the Beach Sands in the Richmond River District, N. S. Wales," J. C. H. Mingaye; "Platinum and its Associated Metals in Lode Material at Broken Hill, N. S. Wales," J. C. H. Mingaye.

A CAPITAL pennyworth of science is the "Amateur Naturalist," the organ of the Amateur Natural History Society. It may be had from W. Longley, 12 White Hart Street, Catherine Street, Strand.

THE May number of the "Naturalist's Journal" is, as usual, full of valuable and interesting notes for collectors of natural history specimens.

MR. R. D. PEDLEY, in his paper on "The Teeth of Pauper Children," reprinted from the "British Journal of Dental Science," calls attention to the neglect of the teeth almost universal in such charity institutions. If the governing bodies could only be brought to see the necessity of appointing a competent dentist to examine the children's teeth at certain intervals, say once a month, much ill-health and misery for the children might be prevented.

THE May number of "Natural Science" among others contains the following papers: "Natural Selection and Lamarckism," W. P. Ball; "Biological Theories: Supposed Auditory Organs," C. H. Hurst; "The Fruit-Spike of Calamites," T. Hick; "The Succession of Teeth in Mammals," Miss E. C. Pollard; "The Recapitulation Theory," C. H. Hurst: "Climate and Floral Regions in Africa," G. F. Scott Elliott; "The Moas of New Zealand," H. O. Forbes.

GEOLOGY.

ON the eastern slope of the Black Mountain, on the border of Monmouthshire and Hereford, in a purely old red sandstone district, I was much surprised a few days ago, to find *Polypodium calcareum* in profusion, many thousands of roots growing luxuriantly amongst loose blocks of old red sandstone. With the exception of occasional bands of cornstones, the nearest limestone rocks are at least ten or twelve miles distant, across two or three mountain ridges. The nearest habitat of *P. calcareum* known to me is on the outcrop of the carboniferous limestone, at least twelve miles away. Can any of your readers inform me whether *P. calcareum* is found elsewhere growing freely on non-calcareous rocks? Associated with the *P. calcareum*, *Polystichum letatum* was fairly plentiful, but much less so than the limestone polypody. There were also two or three varieties of Cystopteris, a typieal fern of these mountains. I may add that I know the district in question thoroughly, have searched it for ferns during many years, but never found *P. calcareum* on the old red before.—*Thomas Jones*, *Newport.*

BOTANY.

GEUM INTERMEDIUM IN SUSSEX.—This plant, which has not hitherto been noted nearer to Sussex than North Hants, has been lately met with at Racton by Mrs. Hipkin, from whom I received specimens. It has been observed that it usually oecurs in the vieinity of *Geum rivale*, and it was so found there. There was, however, this peculiarity, both flowers were growing on elevated and dry ground, whereas all previous examples of the water-avens which I have seen in Sussex grew in low and damp situatlons.—*F. H. Arnold.*

NOTES AND QUERIES.

CHANGE OF CLIMATE.—The part taken by the goat in reducing fertile regions to the condition of rainless deserts is now well recognised, and attention has lately been drawn to a similar part played by the camel in Egypt. Is it possible that Peru was anciently more fertile than at present, and that the change has been brought about through the agency of the llama or vicuna?—*J. R. Holt.*

WARNING COLOURS.—There seems to me to be a slight difficulty connected with the development of warning colours, which possibly some of your readers may be able to clear up. To make our ideas definite, take the case of the *Heliconias.* Here an unpleasant taste is associated with a peculiar coloration. Now, either (1) the taste was developed first, and then the colour, or (2) the colour first, and then the taste, or (3) both were developed simultaneously. First consider hypothesis (1). I do not quite see how the taste *could* have been developed when the enemies had no à priori means of discriminating between those who possessed the taste and those who did not, as it is obvious that the mere unpleasantness, which only became obvious when the individual was killed, could be no protection to the individual, whatever it might be to the whole species. However, suppose the taste *was* developed; then on the first appearance of the coloration, it would be suggested to the enemies that this was another species, and presumably not so unpleasant. So the coloration, instead of being a protection, would actually be the reverse, and would be suppressed, instead of encouraged by natural selection. Now take hypothesis (2). Supposing the colour developed, the same difficulty as before arises with regard to the development of the taste. Now take hypothesis (3). This may be divided into two. Either (a) the colour and taste, although developed simultaneously, were independent, or (b) they were connected. On supposition (a), the same difficulty again arises. If unpleasant-tasting individuals did not constitute a larger proportion of those who possessed the coloration than of those who did not, there would be nothing to connect the two in the minds of the enemies, and neither the coloration, nor the taste would be any effective protection. We thus come to supposition (b), that the two were connected or "correlated." But this again is in no sense an ultimate, or even sufficient explanation. In the majority of cases, it seems to me that "correlated" is used as a convenient term to express our ignorance. When two things are correlated, as far as I can see, there must either (1) be a necessary connection between them, and although this connection may be difficult to trace, it is a proper subject for investigation, or (2) although there is no *necessary* connection between them, a conneetion has been established by natural selection (or otherwise, possibly), and this establishment must have been prior to, and independent of, the question under discussion at present. And this again is a very proper subject for investigation.—*J. R. Holt.*

BUTTERFLIES COME HOME TO ROOST LIKE POULTRY.—We were at Freshwater Bay; the breakfast-room window looked into a long garden the width of the house; ivy grew all over the garden-walls. I sat at the window one morning and saw a red admiral butterfly come from under a leaf and, after flying about a little, settle upon a German aster under the window. I said to a lady in the room with me, "There is the first admiral I have seen this season, and I hope the poor thing is safe from being killed, for he has lost nearly half of one of his lower wings; it spoils his beauty, though he can fly very well." After a bit he flew over the wall and away, and I saw no more of him all day; but chancing to be looking out at butterfly bed-time, my friend came back over the wall, and at once went to rest in the place he had left in the morning. Of eourse I timed him and kept a sharp look-out, and he was regular for a week, and then one night he did not return, and I saw him no more. I suppose a boy or a bird ended his small life. I had, of course, noted many times that the night-moths of various sorts fly at various hours, but sleeping in the same place was new to me. I have seen the sulphur butterfly do it in our own garden for several days (since I noticed the admiral), but that was the first time I noted it, and the fact may be new to some of your readers. I can send you one or two more short scraps of live things which have come under my notice, if they are of any use to you—but not of insects, as most particulars are known to observing persons.

A TALKING SPIDER.—After an accident, being for many weeks kept on a sofa in one position, also very fond of natural history, and unable to sit up or work to amuse myself, I kept a sharp look-out upon all the inseets which were kind enough to call upon me. I was so still that nothing minded me, and they crept and flew and settled and buzzed—the grand recipe for making friends with all the pretty creatures is to be quiet. My window was always open, my sofa close to it; in one corner, to the distress of my attendant, was a fine house-spider, dark, and with the longest possible hairy legs. The flies worried me, also the gnats, and I was obliged to have them killed; it struck me one day I would feed and tame my spider; he scampered away at first, but finding that I did not break his web, he would rush out and sit expectant whenever I lightly touched his web, and pounce upon the dead fly as I presented it. This went on for some time—and now for the strange part of the business, which fairly startled me. As I presented a fly, I heard a tiny squeak something like the cry which a bat makes when chasing a fly in the air. I could not believe it was my spider, and had to wait until the next evening with what patience I could, the fly I had presented having been as much as he cared to accept at one sitting. The next evening I gave careful attention, and the spider again gave his shrill and tiny call as I touched the web. I was much astonished, and thought I had better have somebody else to hear that a *spider had a voice*, or I should not be believed. I therefore desired the housekeeper to bring me up something, and said, "You shall see my spider have his supper." I did not, of course, tell her why. I presented the fly, and the spider gave his call at once. "Oh! madam, the thing called out!" she cried. Of course I was delighted, two people making the thing sure. A few days after that I was well enough to go to another room for a little change of air, and when I came back at night my pet was *non est*. A housemaid had given my room a good dust-out and killed the spider. I nearly cried.

An Abnormal Lamb—Not often does nature make mistakes and turn out her work unfinished, but this week we have had an exception to the rule in the shape of a lamb—one of a twin—born without a tongue, or at least with only the merest apology for one. The under-jaw was 1½ inch shorter than the top one, and although we tried repeatedly to get it to swallow milk, it was unable to do so. To save it from starving to death we were obliged to kill it, and on careful dissection we found it had a small tongue about the size of one's fore-finger nail, and about ¼-inch thick. Being so short, any attempt of the lamb to swallow, pressed the little tongue over the mouth of the œsophagus, and thus prevented the milk from entering the stomach. The trachea was normal, and the lamb otherwise strong and healthy. —*J. H. W.*

A Cure for Stammering.—We are told by compilers of statistics that there are more than thirty thousand stammerers in Great Britain. If this be so, and there is no reason to doubt the statement, the following communication, which has appeared in the "British Medical Journal," will be read with interest by a very large number of persons. Dr. F. L. Nicholls, Fulborne, writes:—"This infirmity is so great a drawback to almost every walk in life, and for public speaking so complete a hindrance, that a cure is of the utmost importance. It may therefore be of interest, and possibly of some use, to members of the medical profession having a case of this nature in their practice, and desiring assistance for its cure, if I mention that I recently have had the most satisfactory experience of the cure of such a case. The father, a minister, was very anxious for his son to follow in his own footsteps, while the lad stammered so badly it was not to be thought of, unless a cure could be effected, and for this purpose he was sent to Mrs. Behnke, of Earl's Court Square, London. Mrs. Behnke was chosen from high recommendations, and very thoroughly has she proved worthy of them. The lad has just returned home, and speaks without the slightest impediment. I should state that before going under Mrs. Behnke's hands, we had tried various rules and recommendations without the least success."

Australian Snakes.—Professor Baldwin Spencer has contributed an interesting article on Australian snakes to the Melbourne "Australasian." The Professor describes the characteristics of the various species which are found on the Continent. In the course of the article he says:—"Luckily for us in Australia our snakes do not belong to the most venomous kinds, such as are frequently met with in India, for example. Whenever any one does happen to die after a snake-bite—which, in proportion to the population, is very rare—we certainly hear a good deal about it, though it is quite possible that the death is due rather more to a mixture of fright and so-called remedies than to the direct action of the snake venom. In snake-bite much depends upon the amount of poison which the snake produces and can inject; and luckily our Australian forms only secrete a comparatively small amount, and are hence relatively harmless when compared with those which in India are responsible for some 20,000 deaths annually. Our Australian snakes, for example, do not secrete anything like the quantity that a cobra or a rattlesnake does, and are hence proportionately less dangerous. Fortunately also for us, we have a habit of going about clothed, and the poison fangs of our snakes are not long enough under ordinary circumstances to do much harm, if they have to bite through leather or even ordinary clothes; and beyond this there is satisfaction in the knowledge that if it can do so a snake prefers to get out of your way. Many people seem to regard the Australian bush as a hotbed of snakes, whilst, as a matter of fact, you can often travel through the scrub day after day without seeing any trace of a snake, and certainly without running more than the smallest chance of being bitten."

A Tomtit's Nest.—Miss Simcox Lea writes as follows to the "Spectator," from Tedstone Delamere Rectory, Worcester:—"A pair of tomtits have built and hatched under an inverted flower-pot in my garden. The nest is on the ground, but in a sheltered and very dry position, and the flower-pot is eleven inches in depth with a diameter or base of thirteen inches. The tomtit builds a closed nest entered by a small opening at the side, and in this case the adaptation of the habit to the situation is curious. On the removal of the covering flower-pot, a circular cushion filling the whole ground-space is shown, nearly two inches in thickness; moss on the ground, wool and hair above, like the wall of the ordinary nest. The nest proper, with about a dozen young birds, is at one side, where the slope of the pot and a sort of protecting wall or pad of wool would act as a covering; and the old birds have access through the hole in the bottom of the flower-pot. How the young birds are to get out of this nest, with some ten inches of vertical flight to manage, is not clear."—*Tedstone Delamere Rectory, Worcester.*

An Intelligent Parrot.—Of all the numberless stories of animal intelligence that are upon record our readers will probably be inclined to admit that they have seldom come across one, equally well authenticated, that is stranger than the History of a Parrot as told by her some time master elsewhere. The common—all too common—green parrot of Indian fields and groves is not a creature to which we are in the habit of attributing any interesting qualities. It is, to say the truth, a mischievous and blatant bird: and its screeching flocks can only be tolerated in the belief that they may serve to keep a check on some other nuisance in the scheme of Nature which otherwise would become still more formidable. Yet here was a member of the species that suddenly and without any advantages of education developed all sorts of high qualities—affection, gratitude, retentive memory, considerable powers of reasoning — far beyond the scope of most birds that have been reared in cages from their youth up. And what distinguishes the case of this bird from theirs was her capacity of living a double existence, taking to the woods with her wild friends and relatives for months at a time during the nesting season, and faithfully returning for the rest of the year to her owner's roof. The cleverest feats of the domestic talking parrot or crested cockatoo are on a low level compared to the intelligence of this unsophisticated bird. Was this a Bacon or Socrates among green parrots, or is it that that noisy race are capable of higher things than we are accustomed to suppose? — *From the "Pioneer Mail," Allahabad.*

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

W. J. Paul.—For the management of your aquarium, see Taylor's book on "The Aquarium," published by Chatto & Windus, 214 Piccadilly, where you will find the information you desire.

Mr. T. S. A. Cockerell has changed his address from Kingston, Jamaica, to Las Cruces, New Mexico, U.S.A.

EXCHANGES.

British shells: *P. similis, C. minutum, T. helicinus, R. cancellata, R. striata, R. punctura, S. planorbis, T. testudinalis, L. divaricata, L. pallidula,* and others. Wanted in return: *D. rotundata, G. fragilis, S. antiquatus, M. Binghami, G. dubia, C. lævis, O. patula,* rare varieties of land and freshwater shells, crustaceans, echinodermata, etc., not in collection.—James Simpson, 6 North St. Andrew Street, Aberdeen.

Small collection of British birds' eggs and nests, offered in exchange for foreign shells.—C. Hinscliff, 5 Mount Preston, Leeds.

Wanted, fertile specimens of any *Lycepodium selaginella* and *Pillularia globulifera.* Well-mounted botanical sections in exchange.—P. Vancesmith, Escobeck, Bath.

Can offer *Anaplognathus viridi, A. porosus,* and *A. analis,* all from New South Wales, for other coleoptera, British or exotic.—John M. Whitehead, 65 Albert Place, Galashiels, N.B.

Have large number of named mineral, ore, and fossil duplicates. Will exchange for other types not in my collection. Send lists or particulars.—Chas. Wardingley, Littleborough, Manchester.

Wanted, a few correspondents interested in the rotifera to exchange bottles of water from their various localities. Offered, the doubtful œcistes, *Melicerta ringens.* Wanted, *M. conifera, Asplanchnadiæ floscularidæ* (except ornata and cornuta), etc.—Ernest H. Tugwell, 6 Lewisham Road, Greenwich.

Offered, standard books on zoology, philosophy, chemistry, physics, mathematics, and general science; also a quantity of chemical apparatus.—Roberts, 22 Carlingford Road, Tottenham.

Wanted, Cook's "Freshwater Algæ," and Gosse's "Tenby." Address—Sebright House, Tettenhall Wood, Wolverhampton.

For exchange, *Pupa filosa, P. Australis, P. exigua, Vitrina limpida, V. pellucida, V. nivalis, Prosepeas acutissimus, Stenogyra angustior, Helix lais, H. harpa, H. gracilicosta, H. excentrica, H. dentiferus, H. nitella, Cleopatra moniliata, Helicina picta, Pupina artata, P. Blanfordi,* etc. Wanted, exotic land shells.—Miss Lister, Arragon Close, Twickenham.

Offered, *P. vivipara,* type and var. *unicolor; P. contecta, A. anatina, P. corneus.* Desiderata numerous.—C. Coles, 61 Barrington Road, Brixton, S.W.

Wanted, foreign land shells; will give foreign rhopalocera in exchange.—Col. Parry, 18 Hyde Gardens, Eastbourne.

Wanted, Geikie's "Text-Book," Lyell's "Principles of Geology," Tate and Blake's "Yorkshire Lias," Phillips' "Geology of Yorkshire," and "Mountains, Rivers, and Sea-Coast of Yorkshire," in exchange for Talmer hand-camera, new, cost 3*l.* 10*s.*—J. H. Lofthouse, 42 Mayfield Grove, Harrogate.

Wanted, young healthy and tame dormice, in exchange for foreign stamps, splendid copies; lists sent. What offers?—Mr. A. E. Arnot, 12 Elmswood road, Seacombe, Cheshire.

Offered, minerals, books on entomology, botany, geology, etc. Wanted, pure Ligurian bees, and apiary appliances.—G. Barker, 24 Avenue Villas, Child's Hill, Middlesex.

Wanted, Wolle's "Freshwater Algæ of the United States," 2 vols., pub. 1887.—F. R. Brokenshire, 24 Oxford Terrace, Exeter.

To exchange, eggs of roseate, sooty and noddy terns, Bartram's sandpiper, laughing gull, and others. Many varieties wanted. Send lists to—W. Wells Bladen, Stone, Staff.

Wanted *Avicula cygnipes* from the Lias, or *Unio valdensis* from lower cretaceous. I will give half-a-dozen good perfect fossils from the carboniferous, or from any other formation, for a good specimen of the above. I have also the following good specimens for exchange: ventriculite, *Ostrea Marshi, Terebratula globata, Calmene Blumenbachi, Nucula hameneri, Oldhamia antiqua, Productus Burlingtonensis, Gryphæ dilata, Holectypus depressus* (urchin), pecten (Lias).—P. J. Roberts, 11 Back Ash Street, Bacup.

Micro. slides: louse of fowl, head-louse, sheeptick, cuticle of onion, T.-sect. orange-peel—8*d.* each, 3*s.* the five.—C. W. Maw, Bradford, Yorks.

Lepidopterous and other insects, with a few land shells, personally collected in Sierra Leone, to exchange for foreign lepidoptera and coleoptera. — Dr. Clements, Frindsbury, Rochester.

Wanted, purchase or exchange, any species of land and freshwater shells, and books and pamphlets on the subject; or small collection of specimens, if cheap.—H. S. Wallace, Art Gallery, Newcastle-on-Tyne.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Food of Plants," by A. P. Laurie (London: Macmillan & Co.).—Essex County Council Technical Instruction Committee, "Report and Handbook" (London: Hayman, Christy, & Lilly). — "Trinidad Field-Naturalists' Club" ("Mirror" Office, Port-of-Spain).—"The Teeth of Pauper Children," by Richard Denison Pedley, F.R.C.S., L.D.S. (London: J. P. Segg & Co.).—"The Iron Ore of Great Britain and Ireland," by J. D. Kendall (Crosby, Lockwood & Co.).—"Physiology of Vertebrata," by A. B. Griffiths (London: L. Reeve & Co.).—"The Nests and Eggs of British Birds," by Charles Dison (London: Chapman & Hall).—"The Microscope" (The Microscopical Publishing Co.).—"The American Monthly Microscopical Journal" (C. W. Smiley, Washington).—"The Entomologist" (London: West, Newman & Co.).—"The Midland Naturalist" (London: Simpkin, Marshall & Co.).—"The Essex Naturalist" (Chelmsford: E. Durrant & Co.).—"The American Naturalist" (Philadelphia: Binder & Kelly), etc., etc.

Communications received up to the 10th ult. from: J. M. W.—W. W.—W. G. C.—C. H.—F. R. B.—P. V.—W. W. B.—J. R. H.—H. E. G.—E. H. T.—C. W.—R.—J. S.—Miss L.—G. I. P.—G. B.—P. J. R.—A. E. A.—J. H. S.—W. J. P.—A. H. S.—C. D. R.—H. F. T.—C. W. M.—T. D. A. C.—W. H. B.—Mrs. C.—J. H. W.—A. D.—etc., etc.

THE FLOWERS YET FRESH FROM CHILDHOOD.

By A. H. SWINTON.

ON gazing idly out of the window at Geneva the morning after arrival, a long line of wild crags bathed in a soft and rosy mist, with azure shadows, rises to greet the binoculars of the wondering tourist. Possibly, in his hurry to get off to Chamounix, he will the next moment forget the beatific sight, or consign it to dreamland. Certainly, if his conceit be a sprig of edelweiss, and his daughters' desire is to possess bunches of alpine roses to grace their toilet-tables, they would gather neither there; where blushing cyclamens, martagon lilies, astrantia tassels, pretty bead-like berries, and Venus' looking-glasses, are Nature's choicest nurslings. But let us not, then, forget that Dr. Fauconnet, an antiquated adorer of this altar of flowers, has strongly commended it to the notice of the scientist who may desire to wander there in search of the *Doronicum pardalianchus*. The Saleve, as this hill is called, shelves with a mild declivity to the west, but it breaks into a line of limestone precipices on the east, that can only be surmounted at places by footways and uncertain tracks which are all more or less dangerous, so that not a year passes by but what one hears of unwary natives there hurled to destruction. Recently, to facilitate an ascent, an electric railway, direct traction, has been constructed up as far as the Treize-Arbres, and the maidens of Geneva, in their fresh summer prints, are already sighing that it is pretty at the Pitons.

The day is hot, and perspiration is rolling down the forehead: a fly, akin to the cleg, is incessantly pricking, and the turreted rock of the Pitons rises overhead like a little toy into the fleecy sky; and, see, here trudges down the shoemaker of the village. "Please to tell us whether we are on the right road to the Pitons," we shout. "Yes, go on straight," comes the echoing response. "Is the ascent very difficult?" we inquire. "No," is the reply.

Onwards through the brushwood we tramp, gathering yellow foxgloves and yellow salvias; it is the country of red and yellow, for the foxgloves are here all yellow, and yellow campanulas appear on the Juras. While thus meditating on the national emblems, we discover that we have arrived at a little vineyard where the fasciated grasshopper and Jersey tiger-moth are fluttering like pink rags, the latter closing its sandy-clay-shaded upper wings to vanish on the parched footway. "My friends," cries the woman who is watching her amber grapes, "if you are not accustomed to our paths, pray take a guide or pay a visit to the herbalist at St. Julien, but kindly cross over the meadow and keep clear of my vines."

Over the green knoll we go where the Chalk Hill blues are sucking the vetches, and picking the greater pimpinella in the ditch; into the brushwood we bound, by a shady track which leaves us lost in the nut-bushes and blue-bells, where a thirsty erebia butterfly comes and settles on our perspiring fingers. Under the flickering boughs we creep to emerge on to a slope dotted with fruit-trees, where we recline in the shadows and listen to the grasshoppers playing their operatic airs, with a green sod bestarred with purple crocus spread out at our feet. See, the finest of the musicians has a stain of blood-red under his hind-legs that makes you think as you lay hold of it that you have pricked your finger with one of the mountain roses. It would appear to be the kind found by Professor Babbington in Cambridgeshire, and re-discovered by Mr. James King in Ireland. The dame is portly, and she hops but little, for it is her happy lot to listen to that superb comb on her partner's piston-like hind-legs, with which he gives two strokes and a tremulous shake on the air-veins of his wings and produces such a marvellous croaking that you would think that you were listening to an overture from the Mantuan cicadæ, such as Virgil has described. Let us put them up two and two into a vivarium, and hunt for a young frog who may be able to appreciate these goings on.

Now that we are fairly rested we will enter the brushwood again by this apparently very good road swarming with tiger-beetles and fringed with the queen of the meadow. The excellent road has terminated at a projecting rock where somebody has been cutting white-beam. A dark horror seemed to brood in the sunny silence, for on such a spot a woodman lately met with his death, and hark, there is a scream! As might have been surmised, an attempt to scale the barrier leads to a crab-like retreat, when the ark containing the innocent grass-hoppers goes bowling down the slope like a racket-ball. It is provoking to have to return to whence one started, and lured on by some rods of purple lettuce which looked fantastic; here we are lost again like the babes in the wood, and peering anxiously over a stagnant pond fringed with dewberries, whose acid fruit has done little to assuage our tormenting thirst. Having passed the dismal swamp, we emerge on to a slope darkly shadowed with wasp-frequented pitch-firs, whose slippery needles render a scramble up among the semi-defunct broom-rape most uncomfortable, and now we are arrested by another ledge of rock. As we hesitate what to do, there appears, as it were, a small gap above with footsteps in the mire. With a shout of "Excelsior!" up we jump like monkeys on to the smooth-worn limestone ledge, our hearts beating audibly, and in we go at the narrow opening, when we draw breath on rediscovering ourselves surrounded with nut-bushes, where there is a track leading upwards among the undergrowth of wild raspberries and strawberries. Come and let us sit and rest amid this dainty dessert and ruminate on the road-intersected valley and blue and misty lake spread like a map at our very feet. On the placid lake there rests a speck of intense white, the noiseless wing of a bark wafting building-stones to Geneva, which, as seen from this eerie nook, appears to huddle like a little village on its maternal lap of blue. Building, for ever building like the wood-ants, how different arise the mansions of to-day from the Villa Diodati admired by our postillion-sporting ancestors, whose grey walls, silent shrubbery, and brown tiles, crowded on the field of the opera-glasses, seem to recall the age of port-wine. But when you do not know where you are, and only know what you are, it is no supreme happiness to muse thus over crag and fell. So starting to our feet we push onwards until a sudden blaze of green reveals that we have passed all danger, for directly in front of us, on the smooth grass, wiry with winged vetch-like genista, and quivering with hair-bells, reposes the turreted rock of the Pitons. "Is there any water here?" we spontaneously shout to two maidens who are catering for the haymakers. "Yes, straight up under the rock," they answer. True enough a bloom of purple horse-mint is there, and one can almost hear a trickle into a hollow tree-trunk; but wait a moment, for here beside us is a small yellow tulip in flower.

Having drunk of the spring, there remains a little beechen grove to track before we reach the crowning hollow, wind-swept turret, around which is painted in black, "Giavenna, 14 May, 1892." Here, 1383 or 1379 metres above the sea-level, we hunt in vain for the eryngium, which, like the so-called sea-pinks, decks many a mountain's brow, possibly the grinding glaciers are explaining why, perhaps the seed-pecking bird is saying how our ancestors came here to see dragons, and to wonder why shells, other than escargots, were found so high up: whereas time has now made all this as clear as the names of the two maidens freshly painted upon the rocky slabs, La Da, La Lize, and Le Gil. Blithe were it to sit here like them, and listen to the tinkle of the bells, and bleatings of the flocks of goats.

But see, the sun is already dipping to the purple screen of the Juras. We therefore hasten down and speed away over the grassy plateau to the hamlet of La Croisette, where there flaunts a glimpse of the Lake of Annecy. Insensibly, an orange glow has flooded the western plain, where the sandy glacier-fed Arve rolls its turbid ochrey stream to mingle with the effervescent rush of the lake-fed Rhone that meets it with a blue icy shimmer. Sweetest vale,

"How calm could I rest,
In thy bosom of shade, with those I love best;
When the storms that we feel in this cold world are past."

Like the Kishon, nachel kadumin, the Arve would appear to be a torrent under the direct command of the suns in their courses, for was not the recent sweeping away of the baths at St. Gervais nearly contemporaneous with the blowing up of two steam-boat boilers? And, softly, do not the annals of its inundations during the past century bespeak the un-decimal periodicity of their phases—1667, 1673, 1711, 1733, 1773, 1778, and 1787?

It is a weird spot this where we are resting, for here the scattered scrub of beech, and the worm-tattered nut-bushes, present the fantastic forms of their near neighbours, the junipers, from which the last, certainly, in the glamour are undistinguishable. Unearthly, like the imps on gothic spires, they seem to be the torn banners of the heavenly host. Slowly a herd of cattle, that would do credit to Nestlé, come footing by, fitfully tinkling their bells; and now there again arises the voice of admonition, for "You have yet a two hours' walk before you arrive at the end of the plateau," says the herdsman; "and the next time that you come here you had better ascend from Collonge.

We start to our feet and dance away like ignes fatui across the moorland, where the yellow gentians stand up like church spires, until, having bounded over dyke and fence, we discover ourselves to be down in a deep and shady dell where a monster plume-thistle, the *Cnicus rhaponicum*, lies top-heavy like a snake in the grass; and then, as we scramble out of the gorge, a double-headed carline thistle glimmers satiny-white. Indeed, it would seem from the frequency of fasciated composites in these parts, as if flowers of this description had a tendency to become larger and more showy, while those which, like the orange *Hieracium aurantiacum*, produce rayed and rayless blossoms, and thus unite in themselves the two great classes, would indeed appear as if they were fresh from childhood, for now we know that there breathes a living whisper from these shores.

But the citron-glow on Mont Blanc, whose profile is that of a bearded hero lying in state, has faded, and transfigured, his garments and visage are shining ghostly and blue, while the lower mountains that compose his bier, pale and wan, have taken on themselves the look of dragons of the prime. The shrill noise of the leaf-crickets now rings incessantly on the ear, and we hasten and stumble over nobs and rocks of offence to the Treize-Arbres, 1172 metres, and then quicken our pace to a run down the rough and winding fir-shadowed road conducting to the Pas de l'Echelle. We have arrived on the brink of the precipice, the home of the *Doronicum pardalianchus*. Is the descent yet possible? Feeling, like blind men, with stock and sticks for the rock-cut steps, awkward in the prime, crossing planks that give hollow groans, staying our feet lest we should trip and plunge headlong, we at length emerge on to a blurr of white with the faintest dark selvage and tinge of grey, the only indication of a foot-track, and now all seems white. No, safe at last, the quarryman's lamp is in our faces, and the watch-dog is barking loudly at our heels.

The evening lamp sends its accustomed ray, the spoils of the Saleve lie upon the table, and the red-legged grasshoppers, contrary to their wont, are chorusing the rumble of the wheels and the tintinnabulation of a harmonicon. And then what a mingled sentiment whispers from the flowers! Here is the meally guelder rose of the Surrey hills, the grass of Parnassus of the Highland moors, the fragrant butterfly-orchis, and the mountain-vanilla, and one lovely blue Irish gentian, the last of the season. Here, likewise, are pinks that innocence might gather for a button-hole. Is the pride of the Cheddar cliffs among them? How vain is the question. Brown, Jones, and Robinson, have all along been calling the auriculas, primroses, the narcissus they have taken to be a kind of lily, and they cannot distinguish between the *Spirea aruncus* and the Japanese Hoteia. The morning shines, and I revisit my den of grasshoppers. The female yet lives, but around her repose her lovers, dead and mutilated. Were it not better when summer is over to fade thus, when all fair things are fading away? she seems to say in speechless agony. How much better are we than they?

DETRITAL CHARACTER OF THE LOWER GREENSAND OF THE WEALDEN.

By H. W. Kidd.

HAVING given some account of the pebble bed of the lower greensand of Godalming in Science-Gossip for February 2nd, 1880, I take the liberty of sending you a few observations respecting the detrital character of the lower greensand. Speaking roughly, the lower greensand of Surrey and Kent is a mass of coast-line débris from top to bottom. By referring to the diagrams annexed to Mr. Etheridge's paper on "The Position of the Silurian, Devonian, and Carboniferous Rocks in the London Area," "Popular Science Review," N.S., vol. iii. p. 279, fig. 2, it will be seen at a glance how the greensand of Reigate passes under the north downs and thins out against the palæozoic rocks of Devonian and Silurian age. Now if we bear in mind that the rise of the strata towards the south is of comparatively modern date, and quite foreign to our present subject, we shall easily see how the waves of the advancing greensand sea would break up and sweep back the old rocks, spreading out sand and shingle over the fresh-water beds of the Wealden.

Now, whether we take Reigate, Godalming, or Maidstone, or any place on the outcrop of the lower greensand, north of the Wealden, the facts remain essentially the same. As long ago as 1856, when next to nothing was known of the distribution of rock masses beneath London, Mr. R. A. C. Godwin-Austin pointed out in a paper on the "Possible Extension of the Coal Measures beneath the South Eastern Part of England" (Proc. Geol. Soc., vol. xii.), that the materials of which the greensand débris is composed could only have been derived from palæozoic rocks. Speaking of the greensand of our south-eastern counties, he says: "The materials which compose the shingle-beds are identical with those of the Farringdon gravels which have been already described, and I cannot do better therefore than borrow a few lines from that paper:—'The mineral character of the pebbles which compose the gravel suggests considerations of much interest in the history, and source of origin, of the materials which compose the secondary deposits of this country. The pebbles, as a mass, have been derived from altered sedimentary strata, such as shales converted into flinty slates, or hornstone, and which must also have contained great subordinate veins of quartz-rock; water-worn crystals of felspar may also be detected, indicating the loose structure of the mass of felspathic granite or porphyry, from which they were separated'" ("Quart. Journ. Geol. Soc.," vol. vi. p. 458). I make no apologies for the above, firstly, because it gives a more comprehensive view of the subject than anything I am likely to indite, and, secondly, because the volume is probably not accessible to most of the readers of SCIENCE-GOSSIP. A little farther on, Mr. Austin says: "If sections be taken at intervals within the Wealden area, as from Farnham to Maidstone, an insight will be got as to the change which the beds of the lower greensand undergo from south to north, and it will then be seen that the subordinate shingle-bands became coarser northwards, so that at the latter place rounded blocks of granite have been met with nearly a foot in diameter. Such a fact as this is of itself sufficient to indicate the direction in which the coast-line of the lower greensand lay."

After the above quotations a few observations on the pebbles themselves may not be out of place. The black flinty pebbles so abundant in the Bargate pebble-bed are usually sub-angular in form, but appear to have undergone a vast amount of wear. They are derived from the harder bands of old rocks such as occur in the West of England. Some I obtained from Littleton appear still to retain their slaty cleavage, as if their metamorphosis had not been quite complete. The brown flint pebbles seem similar, excepting in colour. The quartz of the Bargate pebble-bed is very much worn, but in some of our ironsands I have found exceedingly sharp fragments. Quartzite pebbles are rare. Agate and jaspar occur, but are rare; but it must be borne in mind that these terms are not strictly accurate. There are also a few fragments of hard flinty rocks, which are scarcely at all water-worn. In the event of pebbles of the lower greensand being recognised as older than the rocks which have been reached north of London, namely, silurian, the question arises, Are we to suppose that the rocks formed part of the coast of the greensand sea, or were they derived from some older pebble-bed? The silurian rocks themselves abound in pebble-beds and conglomerates, not to mention abundance of pebbles in beds of younger strata. I am sometimes disposed to take the latter view, seeing that the pebbles occurring in the fresh-water beds of the Wealden are also palæozoic. Now the Wealden is an estuarine deposit throughout, and it is generally admitted that river action alone is inadequate to reduce such hard material as those in question to pebbles. I take them, therefore, to have been brought down into the estuary by rivers from old marine pebble-beds existing on the ancient continent. Thus, in the flint-gravels of our modern rivers no flint-pebbles occur, except such as have been derived from the lower tertiary. Besides the pebbles and rock fragments there are a few rust-flakes, bronzy-flakes, and nodules, as also minute iron-cists, but these are of no particular interest, they may have come from almost any bed, the lower beds of the greensand not excepted. Very probably they are of the same age as the ironstone casts, such as the ammonites, Lamberti, from the Oxford clay. Besides the pebbles of the Bargate, there is, in some localities, as at Great Tangley, near Chilworth, a collection of pebbles quite at the top of the Hythe beds.* There is a pit near Chilworth, or rather a sand-hole close to the tail of the "y" in "Great Tangley" on the one-inch map of the Geological Survey. The pebbles here are dispersed throughout the sand-beds and are not in regular seams. Many of them are exceedingly shiny, which is probably owing to their extreme hardness, those which have been exposed to the wash of the rain in the runnels are especially shiny. A friend has cut open one of the shiny black pebbles: it is red inside and seems like an agate. Here I may remark, that although most of our pebbles appear to be water-worn fragments torn from some larger mass, there are a few which have a nucleus differing in colour and even in texture from the exterior. These may probably have been formed in the cavities of igneous rocks. Turning to the west of Godalming, there is a sand-hole at the corner of Shackelford Heath, close to the junction of the Folkestone and Hythe beds. Here I found a large pebble of saccharine quartz. The sand of this pit is somewhat similar to that of Tangley pit. There are small angular fragments of quartz.

Turning, now, to the Farnham and Crooksburg district, palæozoic pebbles occur wherever the turf is broken for digging ironstone, as between Hankley Hill and Yagden Hill, near Stockbridge Pond. There has been a large quantity of ironstone (the Carstone beds) dug on Charles Hill. In it I found large quartz and quartzite pebbles; one, a large pebble (probably of quartzite), weighing twelve ounces. I have received palæozoic pebbles from Frensham, Great and Little Ponds, Tancredsford Common, and Churchers Hill. A friend remarks on a selection of pebbles (mostly from Charles Hill), that they are from the old palæozoic series, of which we have an exposure at the surface along the Franco-Belgian range, and as near to us as the Boulonnais district. They are mostly, if not all, from the silurian and even lower series, with great quartz veins. It is possible that these pebbles above the Bargate may have been derived from older rocks

* I use Mr. Topley's divisions, and include the Bargate with the Hythe beds.

than those of the Bargate pebble-beds,* for the more the greensand sea encroached on the old shore-line, the older the rocks would be, seeing that the Devonian rocks were reached at Meux's, and the Silurian rise to the north of them, and were reached by a boring at Ware, at which place the upper silurian occurs almost immediately below the gault, the lower greensand being represented by a thin stratum of carstone only.

It now only remains to account for the presence of the extraneous fossils. Any geological map will show how the greensand rests on the oolites to the north west, and I am disposed to believe that all our extraneous fossils are derived from these beds, and not from triassic or liassic rocks, there being no conclusive evidence of these last-named rocks having formed any part of the coast-line of the greensand sea.

LINNÆUS. x ref

CHARLES KINGSLEY called Linnæus a sound-headed man, and Bulwer Lytton said he had the genius of sincerity: he was, moreover, one of the few enthusiasts who, by dint of hard practical work, brought all his dreams to their fulfilment. He held no impossible theories, no high-flown fancies, and his "Systema Naturæ," published in 1735, is, in its essential characters, the same as that adopted in the present day. It remains, despite the rapid march of science, the foundation of all other botanical systems, and, although subject to the development of new arrangements, must always continue of the greatest value to beginners. This work, which he vainly endeavoured to place to any advantage at Amsterdam, was finally printed by a Leyden doctor at his own expense. It is now a bibliothecal curiosity, consisting of eight sheets in the form of tables, and contains a view of the animal, vegetable, and mineral kingdoms, the germ of that scheme of natural history adopted afterwards throughout the world.

If we had nothing else to thank him for, we should owe him a deep debt of gratitude for making a clean sweep of long unpronounceable Latin words, sounding, as a writer of the time declared, like a conjuration of hobgoblins. By applying simple names to plants founded on the essential character of every species, Linnæus facilitated for all time the study of botany.

His treatise on its first appearance provoked the severest opposition. He had written what he knew to be the truth, without the least idea of managing the susceptibilities of his predecessors. "Botanists," he said, "have hitherto wholly neglected the language of their science. More than a thousand names have been changed and introduced since Tournefort's time. What right have I to change them?—because they are not founded on proper grounds and definite laws. Our successors in the republic of botany will ultimately cease to give implicit credence to the authority of the ancients." The maze of ancient names, he frequently remarked, resembles a chaos, the mother of which was ignorance, the father custom, and the godfather prejudice.

To those who care to trace the influence of early surroundings on individual character and talent, a visit to the little village of Rashult in Småland, a province of South Sweden, the birthplace of Carl Linnæus, would be interesting. The trimness and cleanliness of its wooden houses, its white-boarded floors, its rich variety of vegetation, its simplicity and charm, will not be thought of little importance in the formation of temperament and predilections. From the time he could stand the young Carl almost lived in his father's garden, planted with rare shrubs and flowers. Nicholas Linnæus was passionately fond of gardening, and the child, as soon as he could speak, was encouraged to ask the name of every plant he saw, although he would forget it directly after. This became such a habit that his father at last refused to answer him until he should have shown some disposition to remember what he was told.

At eight years old he began to make a botanical garden on a piece of ground given him for his own. It was on an independent plan, and he would bring in weeds and wild flowers much to his own content, but hardly beneficial to the adjacent ground, cultivated chiefly for profit. At ten he was sent to the grammar-school, or "trivial school," as it was called, at Wexio; but his progress there was anything but satisfactory; his extraordinary talent was by no means recognised, and he was looked upon as an idle boy who only cared to escape work and wander about according to his own will and pleasure. At sixteen he had formed a small library of botanical books, and his plant-lore was well known to his school-fellows; but by his tutors he was given up as a hopeless dunce. When this report reached the good pastor and his wife, their surprise was equal to their disappointment, for they had had no doubt of his abilities, and intended him to follow in his father's footsteps, and devote himself to a clerical life.

This he could never be induced to do. In his diary, which he wrote as if it were the history of some ideal person, he describes this unsatisfactory state of affairs: "The father came to Wexio hoping to hear from the preceptors a very flattering account of his beloved son's progress in studies and morals: but things happened quite differently, for although

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* It must be acknowledged that some of the specimens from the Bargate beds of St. Martha's Hill assimulate more with the pebbles from Tangley, than with those of the pebble beds around Godalming; but then it must be borne in mind that the pebbles of St. Martha's are dispersed among the Bargate, and are not so decidedly *below* the Bargate as around Godalming, and therefore may very well be of an intermediate character.

everybody was willing to allow how unexceptional his moral conduct was, yet on the other hand, it was thought right to advise the father to put the youth as an apprentice to some tailor or shoemaker, or some other manual employment."

There was one person, however, who thoroughly appreciated the boy's particular form of industry: this was the physician of Wexio College, Dr. Rothman, who strongly insisted that Carl should not be forced into studies for which he had no taste, but that he should rather be taught medicine, a calling which would interest him and utilise his knowledge of botany. Carl added his own entreaties, and remained with Dr. Rothman, who instructed him in physiology and botany, the latter according to Tournefort, whose system was for a considerable time the favourite one of all botanists. Many Swedish plants were not to be found in his nomenclature, and Carl thought he could himself improve the system, or even invent another which should be more complete. Rothman recognised very soon that his pupil had got beyond him, but he did not know that he had helped to form a greater botanist than Tournefort.

Leaving Wexio, Linnæus was sent to Lund University, and from thence to Upsala, as a superior school of medicine. He worked there with the greatest zeal, knowing that he had only himself to depend on: happy in thoughts of future utility and greatness, and, above all, with an immense love of truth and a longing rightly to name and define things. He had enquired which of the students was the most noted for his knowledge of natural history: the name of Artedi was mentioned.

Peter Artedi was two years older than Linnæus, and, like him, had been intended for the church. They became fast friends. Both were enthusiastic, energetic, laborious, and both miserably poor. Carl was said to be the poorest student who had ever entered the University. "Never mind," he would say, "put a Smålander on a barren rock and he will make his living." The proverb was capped by Artedi: "Nothing like poverty for strengthening the character." The theory might be good, but the practice was cruel. They had to live on bad and insufficient food, and would shiver for hours before they fell asleep.

In the winter of 1728 Carl obtained a royal scholarship, value about five pounds; but this would hardly suffice for the mending of their threadbare garments, or replace the old shoes, of which very little was left besides the strings. They picked up a meal here and there by coaching dull or backward students, but at last in despair and reduced to actual famine, Carl had made up his mind to leave Upsala, when Dean Celsius, Professor of Divinity, who had just returned from Stockholm, chanced to meet him, and was struck with his intelligence. His pale face and wasted appearance told its own tale. The professor engaged him to assist in a scientific work he was then preparing, and entrusted him with the education of his children.

It was a time of comparative leisure, and he was able to draw up his famous treatise, which Dr. Celsius acknowledged to be full of new and brilliant observations. He became a popular teacher and lecturer: the beauty of his face and voice, his simplicity and enthusiasm, completely captivated his hearers; he had a thorough knowledge of his subject, and in the virtues of medicinal plants he was unsurpassed; one of his most eminent pupils said of him: "Science streamed with peculiar pleasantness from his lips. He spoke with a conviction and perspicuity which his deep penetration, his clear notions, and ardent zeal inspired him with. It was impossible to be near him without attention, without participating in his enthusiasm."

All through his studies he kept strictly in view the curative uses of plants, and his work, the "Materia Medica," was long considered the best book on the subject. In 1735 he went to Holland to obtain his diploma, enabling him to practise physic as a livelihood. Learning was then a power, and poor as he was Linnæus lived in intimacy with all the scientists of Leyden. Boerhaave gave him an introduction to Professor Burmann of Amsterdam, who was then preparing a work on the plants of Ceylon, and who gratefully accepted his assistance.

Here he again met Artedi, who was still in the old state of beggary, from which it seemed hopeless to expect him ever to immerge. Carl managed to procure for him some employment, but he was one of those men marked out for evil fortune. The fickle goddess never came to him "with both hands full." Dr. Boerhaave had a patient, by name Clifford, who was an enthusiastic botanist; to him Linnæus was introduced, with a view of helping him to arrange his rare and valuable collection of plants, of which the young Swede displayed such knowledge, that Clifford invited him to share his home with an allowance of 1000 florins per annum.

He writes in his diary: "Thus Linnæus moved to Clifford's, where he lived like a prince, had one of the finest gardens in the world under his inspection, with commission to procure all the plants that were wanting and such books as were not to be found in the library, and of course enjoyed all the advantages he could wish for in his botanical labours, to which he devoted himself day and night."

Clifford sent him to England at his own expense, with a strong letter of recommendation to Sir Hans Sloane, who was then an old man and somewhat averse to new doctrines; he did not, therefore, receive him very warmly, but another letter to Philip Miller, gardener to the Apothecaries' Society, procured him access to the celebrated Chelsea garden, where he found a class of quite new plants flourishing on our chalky soil, of which none were to be found in

Holland or Sweden. "Miller allowed me to gather in his garden," he writes, "and gave me, besides, many dried plants gathered in South America by Houston. The English are certainly the most generous people on earth." The highest possible compliment was paid him after his departure by the re-arrangement of the Chelsea garden after the Linnæan system.

On returning to Holland, Carl was seized with an irrepressible home-sickness. He had been absent four years and was not yet prosperous. Engaged to Elizabeth Morrens, the daughter of a Swedish physician, his marriage, it was decided, should not take place till there was better promise of a settled income. This was, they hoped, to be obtained at Stockholm, where he took up his residence and turned his attention to medicine. It was a hard struggle for a bare subsistence; his reputation as a botanist was not thought to enhance his merit as a doctor; people were slow to believe that a man of learning—a pure scientist—could be a simple curer of diseases, but in the course of his practice he had the good fortune to attend a man of some note and to cure him very speedily of an apparently hopeless complaint. His fame spread to the Court, and he was called on to prescribe for the Queen herself; he treated her with such success that patients grew numerous and fees plentiful. He was appointed Physician to the Navy with pay, and first President of the Academy, with distinction.

By this time, honours had fallen thick upon him; the European Academies vied with each other in complimentary offers of membership. The Royal Society of London, following the example set by Paris, Florence, and other cities, elected him their Swedish Correspondent. Crowned heads came to visit him. Appointed Professor of Physic and Anatomy in the University of Upsala, he was comparatively a rich man and able to marry his Elizabeth. The long years of anxiety and waiting had come to an end, but whilst still in the prime of life, he began to feel the decay of overtaxed powers. Court ceremonial, the whirl of visitors, incessant correspondence became impossible to him, and in spite of all remonstrance he retired to a house he had built for himself, a short distance from Upsala, where his life is described as full of happiness and peace, although the state of his health forbade him to continue working "at more than human speed."

Students still flocked to see him from all quarters of the globe. He assisted all with his advice, and those who needed it, with his purse. Some of the poorest he took into his house.

Although his energy and enthusiasm hardly seemed to diminish, he knew that he had turned down hill, and wrote pathetically of his failing health and memory. "At sixty years of age proper names began to be forgotten by him whose head had contained more of that kind than most other persons." A few years later he had to be carried to his museum, where his whole interest was centred. He died in the year 1778, leaving behind him the record of unsurpassed scientific research, and of a perfectly useful and blameless life.

C. E. Meetkerke.

A PRIMROSE BANK ON A PRIMROSE DAY.

By A. H. Swinton.

THE yellow dials of the Oriental goat's-beard are still open, the night-flowering catch-fly hangs its viscid, shrivelled bells; let us descend from this crag of Toulant, where the yew, and the iris, and gadding vine and ivy darkly hang, and around and around which the bird of prey has been floating, on its far-reaching wings, through the deep, cerulean air of spring; for from these thorny thickets the Ossianic harp of our Celtic forefathers has sounded over the surrounding admirably-designed orchestra of bounding peaks and far-shouting hills, in those stirring times when fear and loneliness made hallowed ground. It spoke in rapture of a fraternity of nations, and, prompted by its vivid wishes and tender hopes, many we know have gone to stray over the flat meadows and parterres that encircle the lake, where primroses, violets, and anemones, the gay decorations of the English coppice-clearing, have sprung up to wanton in the sunshine, and where the sounds of Chene and Rove inform the traveller of hamlets once overshadowed by the pedunculated oaks, whose gnarly timbers, in the decadence of the fragrant loveliness of a pastoral life, must have shivered to the petulant carol of the bacchanalian grape-gatherers of the Lavaux.

> "Sad, sad for the husbandman.
> Why, for why?
> He thinks that I'm his mistress—
> I, not I!"

Here, from whence the rocks of Mellerie may be scanned afar, and where the nearer hillocks tumble idly down to the still water, there are no meadows decked out in funereal glow, there is nothing but a quiet mountain-track resounding to the tick-tack, tack-tick, of the white and crimson wood-pecker, that delves among fields glittering over with the vernal gold of the dandelions, where you cannot open your eyes without being struck by the artfulness of nature. It is a pretty pastime in the prime, when fancy prompts to notice how variously their toothy leaves are notched and cut, and to meditate on the endless diversity of human souls, and from sheer vexation at the nones to blow away their seeds that float off like parachutes, and suggest to the inventive and talented mind, mechanical design. One o'clock, two o'clock, they depart like time and happiness, gliding ever with the sauntering hours. So it comes about beyond a doubt that a certain set escaped from the shining crowd, have rooted and sprung to light upon this stone wall close at hand. Draw, now, a sketch of one and mark it with a T. Its flower-stalks, you remark compassionately, are weak and slender, and notice how certain of them, as it were in compensation, are hammered out so as to compose a lathe-like band. An examination of a series of these dilated stalks, procured from the low, damp orchards, beneath whose shadow they are fabricated year after year, will infallibly convince you that the thinner ones have here united together in the fashion of a double-barrelled gun, forming thus a tube with separating partitions that have afterwards split down lengthwise, and become absorbed by its growth and expansion, so that the root, stimulated by some undetermined cause, has really put forth stems of greater bore with larger and more fiery heads; or sometimes, as you will gather from our sketch, the thick stalks remain as clustered columns crowned with two, three, or more blossoms that have failed to amalgamate. Let us proceed a few steps further and we shall see trailing over this same wall, a gypsy rose, or Knautia, with two heads of three flowers, supported by braid-like bands formed of their three diverging stalks. Is it not wonderful?

The daze of the sun on the revery-haunted crag, giddy flight of the Tau moth, and the luxuriance of the goat's-beard, whose flowers seem to fall in yellow fountains, have seared the soul with the impression of an impulsive and tyrannical nature, and with a painful sense of fading beauty, which is conducive to adoration, we seem to hear a hidden harmony, and to perceive that everything is changing; let us wander, fancy-led, over the vernal bloom. See here, as we rove, is a pink Knautia with the three-fold head and three-fold stem, and quite a number of blue and pink ones that possess a central misshapen head and two lateral bells, which, despite that this plant is a tetandria, show five equal rays, with two calyx leaves, raised on longer or shorter stalks, or on no stalks at all; and, yet more strange, the central stalk of one has taken two zigzags sending out such a floweret at each angle. Among the rotten needles of the fir-wood the bird's-nest orchis personates the broom-rape, and everything has an environment; can it be now that the gipsy rose, that grows so sadly purple in the shade, is about to appear as a vervaine-like spike on the crag of Toulant? Time was when new flowers were looked for as an expression of an all-pervading mind; in our short-sightedness we conceive that there is nothing new beneath the sun.

A bee-hawk moth, on account of its olive tint easily mistaken for a moss-carder bee, suddenly poises over a Knautia, slyly depresses its body, and glues on to the under surface of a leaf, an oval, pale-green egg, which, in the course of events, will assert its cadetship as a horned caterpillar; so that the probabilities are that it had ancestors whose wings were mailed with scales, it being only bee-like in its habit of buzzing at meadow-flowers on the skirts of the woodland. Preoccupied with the dandelions of the future, and the hawk-moths entombed in lithographic slabs, we have quite unawares taken our seat upon a bank where grow the rathe flowers which recall our sorrows and consecrate the memory of a scientist. Have we been walking in a nightmare, or has the genius of evolution and ordered progress, waved around us its wand of enchantment, and called forth all that is pleasing and new. At first sight it would appear as though the primroses that we thought to gather are pining away and changing into oxlips, for either they are stunted, showing a blossom or two that rises a couple of inches from the ground, or where the parched soil is caked and hard, and broken escargot shells abound, and glow-worms kindle amorous of the lurid night; their flowers endeavouring to spring forth in their wonted profusion, show taper stems and narrow petals, that cause them to resemble yellow gentians, a class of plants that have so often intimated to us in our rambles over the mountains and hills that we are approaching the precincts of a dry limestone waste. Surely we have here discovered that struggle for existence, concerning which we have heard so much, and in regard to which we have felt so much; let us, with trembling hand, sketch one of these starved and hungry primroses, the child of misfortune, and mark it with a C. Indeed, it now appears that the greater proportion of these plants, among which we are reclining at our ease, are not of an honest stamp such as pert primrose dames would admire; beneath the shadow of the wall they apologetically assume a primrose shape, but even there their stalks are weak and thread-like, and some of them are tied together, and, as for the rest, exposed to the flecking shade and freckling sun, they are mostly changed into rods with two, three, or more prongs; mimic pitch-forks, each capped with its bud or blossom, so that sometimes we see them branching out quite close to the ground, or the terminal nosegay is raised as in triumph high into the air, when wilful fancy pictures that at some period in primrose story, it became so poised to escape from the snow that lies long on the grassy flanks of the mountains. As seen beneath the lens which reveals the scheme of creation, the oxlips mostly have their stamens inserted about a fourth of an inch below the corolla into a little cup, as have some of the nondescript primroses; but since there is another form where the vase-like dilation commences at least three quarters of an inch lower down, it will be worth while to outline these differently-shaped nectar-pots set out for the bumble and butterfly, and we will mark the plants A and B. You may likewise notice a graduated change from the salver-shaped primrose blossoms to the oxlip bells, which either fall straggling like those we will outline and mark D and H, or hang in a contemplative drowse as the bank declines to the setting sun; and, on the other hand, it is quite noticeable that, while the typical oxlip displays its heart-shaped leaves, like the one that we have marked F, most of these transitional forms retain the imposing battledore ones of the primroses. Why the mountain oxlips weep thus gracefully in saffron attire, it would be hard to affirm, but a plant we will portray and mark G, shows one floweret more drooping than the rest, in consequence of a heart-shaped hole which some insect, doubtlessly a short-tongued bee, has vexatiously bitten in its neck after having nibbled off a point of the calyx. Evolution, or strong necessity, we must presume, has an iron gauntlet; and it is only needful to watch the humming-bird moth insert its thread-like sucker into the needle-eyed *Dianthus plumarius* and *squarrosus* that adorn the rockery until its mouth bobs against their clove-scented frills, to know that what is food for the crane is out of reach of the fox. Certain primroses besides, as those we will indicate by D and E, display a simple flower as a satellite to an umbellate head of blossom, which reminds us strongly of our new gigantic dandelions and Knautia, and, indeed, in the succulent stalks of B and C when held against the light, ribby lines of fibre may be seen corresponding in number with the flowerets, and indicating fasciation. In conclusion, most botanists, on seeing our sketch, would be ready to remark that the free-born bees had been at work crossing the primulas to produce a surprise, but then, despite their faint, sweet incense dear to honey-makers, how comes it about that all the cowslips could be distinguished from the buff-coloured oxlips by their sea-green leaves and blunt calyx tips; does it not rather seem true that everything changes with its surroundings, and according to its affinities; the article in SCIENCE-GOSSIP, Vol. 28, pp. 225–6, by J. H. Barbour, will convince any one that primroses are not conservative.

The black squirrel of the Valais is gambolling in the ravine among the wild laburnum and beech, now sitting on its hind-quaters, and now seeming as though it hung by the tip of its tail, in order to gather and munch at its ease the brown husks that it scatters in memory of the year so brightly gone. Let us gain the foot of the hill and spread the plants that we have gathered upon the deal-table in yonder arbour, beneath the commingling glow of the Paulonia and Judas trees, the tall cousins of the foxgloves and peas whose metamorphosis recalls the strangest tales of the "Thousand and One Nights." See, we have already placed in our green receptacle certain flowers of the bladder-campion, stained a delicate or rich rose-colour, which we have grabbed up at the side of the dusty track by which we ascended; they have often purplish stems and diminutive narrow bladders, and we know that it is likewise a capricious plant desirous of producing new races, for did not a downy one establish itself in the botanical gardens at Glasgow, until they were covered over with opulent residences? and then *maritima*, whose thin spreading stalks and ample leaves and petals recall our far-famed boating and bathing exploits, is just supposed to be *inflata* naturalised on the wave-washed turf that it holds in heritage. Let us now stoop and pick a

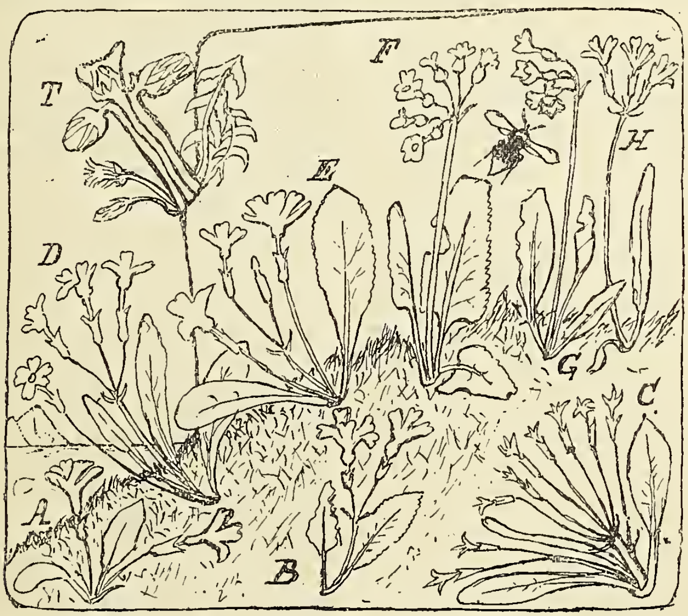

Fig. 81.—Change of Environment. Oxlips become Primroses on the Primrose bank.

handful of the salvias that are growing beside the campion, and which, like the flowering-trees, peas, orchids, snap-dragons, and larkspurs, and other horizontally-shooting blossoms, have their lips pouting and their stamens disarranged by the inquisitive bees, whose attractive hum and frequent kisses may have prompted Roman girls to sing about purple flowers. These, you see, in consequence possess five divisions of the calyx and only four of the petals; there are two developed stamens and two undeveloped ones, showing them to be true dead-nettles which have been gradually degraded as regards their number of floral parts, and in respect to the reproduction of their kind. In Italy the men are handsome, on the Spanish seaboard the women are beautiful; how sad is the thought that breathes across from the rose-trellis and intimates that nature must yield to art.

We will condescend to notice the purple shepherd's-purse and the purple oat-grass, which are likewise the neighbours of the tinted campions. *Maria gratia plena rubella* is hung with the heart-shaped pods commonly confined to the top of the spike of our old friend pastoris, and its petals are smaller, making it appear as though the Punic dye had arrested its floral development. And as to the staining process,—leaves, flowers, and insect-wings are tinted upon an immaculate ground, we presume. For instance, the delicate lemon-coloured blossoms of the minute crucifera, Cypreola, just visible on the wall-coping, after blowing bleach into white; but in what measure the chemistry of the surrounding soil is implicated, remains a question. The alpine anemone is yellow on granite rocks, on English fallows the dead-nettle has a tender red; on the Surrey chalk-hills many garden flowers become white.

Here, on the bank that leads to our arbour, are tiny hair-bells, one of which, sucked by the blight, has assumed the shape of a Chinese lantern, ox-eyes no larger than a daisy; and in the damp ooze of the stream, a real daisy with red and tubular rays resembling a brush stiffened with rouge; also glossy hawthorn with two styles, neat for a bonnet. How recluse is the spot! A subdued warble animates the twilight of the leaves, the lake that glints beneath the garden wall has become streaked over with the dreamy blue that shines from the hepatica on the ivied bank, and curdles on the starch-hyacinths: it tinges the frothing goblet as we raise it to pour in the Yvorne wine. Botany, they say, is dry, because no one can conceive our object in developing the rocks, and leaves, and flowers; we commence to live as if the heavens contained no sadness, the earth no tomb. In an after-dinner nap we fondly recall the grey shingle where we picked the campions despite, and the gristly Apollo butterfly that arose in the gloomy ravine with a rustling sound. When it settled on the roseate Knautia head we examined it a moment in the sunshine, and we noticed on its wings two red burns, such as might have been caused by our holding the lens a little obliquely; but now it appears on waking that the table-napkin which is placed on the head to ward off the meridian heat is quite covered over with similar round wafers and rings of light, notwithstanding that its meshes are square. Two of these celestial crowns, forsooth, must have branded its hind-wings. But stay, what little moth is this idling on the broken pane, whose wings beneath the searching lens resemble an umbrella frame? We have long fancied that it was a flying fan, and have called it the twenty-plumed moth: but its plumes that we took to be the spokes, are recognised to be the branching air-veins of its absent wings, for they remain covered over with their scales, and they are softly-feathered along with their bordering fringe. Other plume-moths which are less fully developed explain this process, for they are only favoured with a feathered notch in their forewings, under which they fold, fan-like, the plumes into which their hinder ones have been already slit. Once upon a time then, the ancestor of this indolent inhabitant of the honeysuckle canopy expanded his wings on the dewy flower-lips and wet grass, and so, indeed, did its descendants, until, in process of time, they became deprived of their delicate membranes and skeletonised like the poplar-leaf when it lies on the decaying mould, and then, as their owners, who were not too gravid to fly, continued to use them, they discovered that they were changed into serviceable feathers. We were quite mistaken in supposing that all the clear-winged, feather-winged, and notched-winged moths and butterflies that haunt the leaf-fall were relatives; the swan-white candy-tuft on the rubbish-heap outside with rib-like leaves, has a story to tell why it differs from the white basket in the flower-beds, and it has no relationship with the fennel save old associations.

Primrose day has flown and the flowers of promise have commenced to wither around the borders of the lake. Let us revisit the happy hunting-grounds of the Celts whose pile-supported villages once dimpled the brink of the tranquil water. Dripping with perspiration, we have at length gained the highland pass, our green receptacle is surcharged with the large blossoms that disclose in the mountain mist, we breathe the delicious air of freedom, and a stony valley and gelid lakelet loom below, where the oxlips are yet in bloom and time seems to linger. These oxlips retain the two forms of cup, but otherwise they are stereotyped oxlips with no lineaments of the primrose. Pause a moment and watch the yellowish dusky-veined white butterfly flit by and settle abruptly in the trickling moss among the soldanellas, which our friend has pronounced to be the ancestors of all their tribe; and whose parasol-like bells are slit up between the veins by the scissors of time and drip of the dews, so as to present the identical ragged form we notice in the wings of the plume-moths.

Enough, our walk has made us hungry, and beside us on the grass are two limestone instruments ground to the shape of carpenter's chalks, one of them is sharpened like a chisel and the other one is pointed. Having the customary outline of a shell, they both fit nicely to the finger and thumb, and either would serve equally well as a knife. The silent mountains that furnished them jut up into the clear sky-like lofty walls and down from their crests that frown aloft like feudal towers, the winter avalanches have been mercilessly crashing. Around us here and there are strewn incisive stone bomerangs, more or less fish-shaped, so as to fit into the palm of the hand, and having a thumb-hole. Here is one on which are scratched, if we mistake not, the Roman figures for twelve, and which should go sky-high. Where are gone the bears that came tumbling in their antics down those perpendicular slopes, the lynxes that glared and sprang from the broken fir-boughs, the boars that rustled and grunted among the beech-mast, the battling stags that drank by moonlight and bounded away at the famished howl of the wolves. Truly, this sweetly pretty valley is most deserted, for it is deprived alike of good and evil, and no voice now whispers in the ear, Arise, slay, flay, and eat.

IS THERE VEGETATION IN MARS?

ON page 376 of M. Flammarion's "La Planète Mars," in a foot-note, the author quotes from M. Trouvelot as follows: "Les grands continents de l'hémisphère nord sont occupés par des taches grisâtres plus ou moins faibles, qui sont disséminées sur eux. A en juger d'après les changements que j'ai vu subir à ces taches, d'année en année, on pourrait croire que les taches grisâtres variables sont dues à une végétation martienne qui subit l'alternative des saisons." More through curiosity than with any expectation of arriving at any results of scientific importance, I determined to take M. Trouvelot's suggestion as correct, and endeavour to ascertain the laws according to which this vegetation varied with the seasons. I expected to find these variations so contradictory that no definite laws could be deduced. To my surprise, this was not the case; I saw that I was arriving at conclusions, which, although very different from my preconceived ideas, were yet perfectly consistent, and showed a remarkable analogy with the variations of terrestrial vegetation. I then determined to investigate the matter more carefully, and as a first step, I drew up a calendar for Mars, covering the terrestrial years 1857 to 1893, by the aid of which I could at once assign any observation to its precise period in the Martian year. The results were, as I have said, surprisingly definite; in fact, when I have made a mistake in taking down the date of an observation, I could generally discover that a mistake had been made, by the discrepancy between the observed appearances, and those which I would expect from the date. My preconceived ideas with regard to the Martian vegetation, were, that it was probably reddish or fuscous in colour, and that the laws of its seasonal variation were probably very different from those of our own. The results which I arrived at were just the contrary; that the colour was some dark tint, appearing dark grey, or nearly black, when seen in mass, and from a distance, like our own, and not improbably a dark green; and that it resembled our own very closely in the way it varied with the seasons. It has been held that the Martian continents owe their reddish colour to some kind of vegetation, and therefore that the Martian vegetation is probably reddish. I do not assert that the Martian continents are not covered with a reddish vegetation; I only say (1) I can find no proof that it is so; (2) this red vegetation appears constant and does not change with the seasons; (3) it shows no tendency to prefer sites near water.

The dark-coloured vegetation is not dispersed over the entire land area; it is confined to places all presumably near water; these are, (1) the canals which appear to be ravines with probably a river at the bottom, but certainly not all water, except in a few cases; and (2) the banks of certain inland lakes. especially Lake Niliacus, Lake Tithonius, and Terby Sea. The way in which it varies with the seasons is different in different latitudes, like our own. Thus, take the northern temperate, say N. lat. 45°. The course of variation is as follows. During the winter no trace of vegetation is perceptible. At a Martian date corresponding to the 12–15 March the first signs appear. These early traces are of a reddish or yellowish brown. (Our own woods often assume a reddish-brown colour in early spring, when seen from a distance.) This colour persists through the early part of April, but by the end of May, the dark green or grey coloration has been assumed, and it remains till the end of July. Early in August the red colour again appears, and soon after all signs disappear. This apparently corresponds to our "fall of the leaf," but takes place at a comparatively earlier date, corresponding to about 12–27 August. So we see that the general course of vegetation resembles what takes place here, but is about a month earlier.

For the southern extratropical latitudes evidence is scanty, inasmuch as there is comparatively little land in the southern hemisphere outside the tropics. Such evidence as there is, however, agrees with this. Thus, apparently, the trees are in full leaf in December, and are bare by the end of February. In the tropics the laws are quite different, and not nearly so definite. The vegetation seems to be a mixture of the northern and southern types, with a small quantity of a true equatorial type, in leaf at the equinoxes, bare at the solstices. There are some exceptions, real or apparent, to these laws. These exceptions are of two kinds. Of the first kind the only example I am aware of is Coloe Marsh. This is situated in N. latitude 45°, hence if it was vegetation we would expect it to be large and dark in the summer, small and nearly invisible in autumn and winter; as a matter of fact, the reverse is the case; the spot is invisible in the summer, and only large and conspicuous in autumn and winter. In the exceptions of the second kind I place spots which follow the general law, but do not always appear at the proper season; these are more numerous; the best example I can give is Lake Tithonius.

To enable those who may be interested in this subject to verify or check these conclusions, I will briefly explain the construction of the calendar. I divide the Martian year into twelve months, roughly equivalent to our own. Owing to the great eccentricity of the orbit, the lengths of these months are very unequal. I reckon in terrestrial days, as being much more convenient when dates have to be transferred from the terrestrial to the Martian calendar. I take the year to begin when the planet is (approximately) in Heliocentric longitude 0°, and for the lengths of the months, expressed in terrestrial days, 49, 53, 58, 63, 71, 66, 63, 60, 58, 52, 46, 48. In this way the months are nearly equivalent to our own, and I call them by the same names. They are not strictly equivalent; thus the Martian "January" about corresponds to 25th December to 24th January, but this can be remembered and allowed for. For the N. hemisphere, the dates of the solstices and equinoxes are, V.E. March 52, S.S. June 59, A.E. September 52, W.S. December 42. I do not give the calendar itself, as the work of drawing it up is purely mechanical. An example of its use will be sufficient.

On the 21st January, 1882, the Euphrates and Phison were seen of a reddish-brown colour by Schiaparelli (Flammarion, p. 358); by the calendar we see that this was the 37th April of the Martian year. This about corresponds to the 13th or 14th April of our calendar, when vegetation in northern latitudes ought to be of a reddish-brown colour. Hence this observation (chosen at random) is conformable to our expectations. In conclusion I have a suggestion to make; if these dark markings are really vegetation, this vegetation resembles our own in so many respects, that it does not seem unreasonable to suppose that it may resemble our own also in owing its colour to chlorophyll.

Now, there is a scientific toy called the erythroscope, described in Rood's "Modern Chromatics," p. 83. (International Scientific Series, vol. xxvii.) The principle of this instrument is, that when a landscape is viewed through a piece of yellow glass, combined with one of blue, both of special tints, the colours of inanimate natural objects are not very much altered, while plants appear of a bright red. If pieces of glass of the proper tints were placed before the eyepiece of the telescope, it is possible that dark markings due to vegetation would assume a ruddy tint, while the seas and lakes would appear unaltered; the experiment would probably fail, but it might succeed, and any way is worth trying. Of course, in order that there should be a chance of success, the experiment should be tried at a proper time of the Martian year; thus the next opposition would not be at a good time; no success could be expected for any of the markings in the N. hemisphere; a month or so before the opposition the experiment might be successful for some of the markings in the S. hemisphere, as Terby Sea and its affluents.

J. R. HOLT.

THE ROSE.

THE rose is always considered the queen of flowers, both from its beauty of form and colour, and also from its delicious scent. In mythology, it is one of the flowers sacred to Venus, in fact, that goddess is supposed to have given birth to it. The story runs:—She was running through the woods in despair for the loss of Adonis, when she trod upon a thorn, which wounded her foot, and the blood which flowed from the wound to the ground, gave birth to the rose. Surely that must have been a red one, and yet there are some old Greek stories, which lead us to suppose that the white ones were the first to come into existence, and our poet Herrick thus accounts for the white ones changing to red—

"'Tis said as Cupid danced among
The gods, he down the nectar flung,
Which, on the white rose being shed,
Made it for ever after red."

However they came into existence, we have now not only the white and the red rose, but also a yellow one; the latter must be of much later origin than the two former, because in any old stories one may pick up about the flower, it is only the white and the red that are ever mentioned. The name "rose" itself denotes a red colour; it comes from the Celtic "rhos," or "ros" in modern Gaelic, whence probably was derived rhodd, red; also the Greek name for a rose is ῥόδον, and ἐρυθρός, red. All our numerous garden varieties are really cultivated forms of the wild rose; they are also made, so to speak, on the same plan, so it will be necessary to understand the structure of the wild rose, and then it will be easy to trace the variations from it in the cultivated plants.

The rose belongs to the botanical family named Rosaceæ; many of our fruit-trees—the apple, pear, and cherry—belong to the same family, also our bramble-bushes, and our thorn-tree; besides many smaller plants with which we are very familiar, such as the potentilla, the strawberry plant, the lady's mantle and avens.

It is an erect prickly shrub; its leaves are composed of several distinct leaflets, which are placed laterally in pairs along the stalk, finishing at the top in a single leaflet; each leaflet is toothed round the edge, like the teeth of a saw. At the base of the stalk of the leaf itself are what are termed in botanical language two "stipules;" they are really modified leaves. They are much smaller than the leaflets; they grow one on each side of the stalk, and instead of growing out from it, as the leaflets do, they are attached to it, and therefore almost to one another, for all their length; the flowers are "terminal," *i.e.* they spring from the apex of the stem, and when the stem has produced its bud it grows no more in length. Sometimes the stem may branch, perhaps it may send off a side-shoot from near its base, and when that shoot grows to be about the same length as the primary one, it buds at its end, sends forth a flower, and grows no more; so that all the flowering stems, no matter where they start from, are pretty well of the same height. The flowers are white, yellow or red; they are not honeyed; the calyx consists of a tube, with the upper part considerably spread out into five divisions; the tube is closely attached to the seed-vessel; it is generally globose in form, or else has the shape of an egg; the mouth, *i.e.* the part just before it begins to spread out, is much contracted; the five divisions into which it spreads when in bud are folded over one another like the tiles of a roof; the petals are five in number, circular in shape, and concave; they soon fall after the flower is fully blown. The stamens are very numerous, and are situated on the disc, which in this case is a sort of thickened ridge round the inside of the calyx-tube, and almost closing the mouth of it; the seed-vessel has many divisions in it, and there are as many styles growing out of the top of it as there are divisions; the styles are short and thickened at the end, which thickening forms the stigmas; when the seed-vessel has ripened into the fruit, the five spreading divisions of the calyx still remain adherent to it, either spread out or reflexed.

It is a plant widely distributed; it is to be found almost all over the world, and there are about a thousand species of it.

Herbalists seem to have made but little use of the flowers for medicinal purposes, but they used the root of the wild briar for making decoctions and infusions, and a conserve made of the pulp of the ripe haws was supposed to be a great aid to digestion, and to be very effectual in checking a hemorrhage. Pliny, in his "Historia Naturalis," says that the bark of the root very finely scraped while fresh and green, and infused or decocted in wine, three or four ounces to a quart of wine, makes a very good cure for the bite of a mad dog, whether for outward application or to be taken inwardly is not specified, perhaps both were intended.

Roses seem from very earliest times to have been much associated with the dead. Anacreon, a Greek lyric poet who lived about B.C. 544, mentions them in one of his lyrics, making the comfort of the dead to depend on their presence; thus we read—

> "When age and vigour do decay,
> The rose their strength repairs;
> It drives all maladies away,
> And can prolong our years.
>
> The dead, too, in their graves do lie,
> With peaceful slumbers blest;
> This is the amulet whereby
> No ills their tombs molest."

It was a custom also amongst the Romans to strew the bodies of the dead with flowers, and it was a regular practice to strew the graves with roses every year. I have no doubt our association of flowers with the dead is a remain of old Roman manners; even now at the present day the custom still prevails in many of the villages round Derby, of hanging wreaths of white roses over the pews of unmarried villagers who have died in their youth; and at Oakley, a small village in Surrey, they are in the habit of planting rose-trees on the graves of lovers, which two instances would lead us to suppose that roses are not only connected with the dead, but with youth and with love.

There are many omens and superstitions in connection with the rose: the blooming of all roses in autumn was looked on as a sign of a plague in the ensuing year; and in Germany it was held to be a certain sign of death in the nearest house when a white rose bloomed forth unexpectedly. The superstitions peculiar to the red rose are mostly connected with blood. The Turks believe it owes its red colour to the blood of Mohammed; and there is a superstition held in France, Germany, and Italy, that a drop of one's blood buried under a rose-bush produces ruddy cheeks. There is also an old charm common to all Germany, and now found in Suabia and Westphalia, against nose-bleeding and all hemorrhages. There is a variation of the words of the charm in each country; in Westphalia they run thus: "Abek, Wabek, Fabek; in Christ's garden stand three red roses, one for the good God, the other for God's blood, the third for the angel Gabriel: blood, I pray you, cease to flow!" In Suabia the words are: "On our Lord's grave spring three red roses—the first Hope, the second Patience, the third God's will: blood, I pray you, be still!" Then there is a third variation: "In God's garden bloom three roses—Blood-drop, Blood-stop, Blood-still: blood, I pray you, cease to flow!"

In old heathen times the rose held a high place as a mystic flower, and the dwarfs and elves had it under their special protection, Laurin, the king of the dwarfs, forbidding anyone to touch it without his permission. As regards its sacred connections, the rose was one of the flowers sacred to the Virgin Mary. According to the old legend, on the third day after the interment of the Virgin, the Apostles visited her grave and found it open and filled with roses and lilies. Like many other flowers, the rose is a weather prophet, and a profusion of bright red hips predicts a severe winter: the words of the rhyme run thus:—

"The thorns and briars, vermilion hue,
Now full of hips and haws are seen,
If village prophecies be true,
They prove that winter will be keen."

There is a charming old eastern fable in connection with the rose and the nightingale, which has been rendered into verse by Thackeray. The bird is supposed to have been dumb till it fell in love with the rose, then it forthwith poured forth its song:—

"Under the boughs I sat and listened still,
I could not have my fill,
'How comes,' I said, 'such music to his bill?
Tell me for whom he sings so beautiful a trill?'
'Once I was dumb,' then did the bird disclose,
'But looked upon the Rose;
And in the garden where the loved one grows
I straightway did begin sweet music to compose."

There is one more old legend concerning this flower which I cannot resist giving; it is a legend peculiar to Schleswig, and tells us how the devil, having fallen from heaven, wished to get back again, and so tried to make himself a ladder of the thorns of the wild briar by which he might ascend, but God did not allow the plant to grow in height, only to extend itself; therefore, in spite, the devil made the thorns all to turn downwards, towards the earth. Others say that the plant incurred this curse because Judas hanged himself on it.

Everyone that is at all acquainted with the rose-tree must be also intimately acquainted with its enemy in the animal kingdom, commonly known as the green-fly, whose right name is aphis. It increases and multiplies at such an enormous rate, that if not promptly killed, the whole plant will be covered with them in a few days. They suck the juice out of the leaves and stems with long suckers which stand to them in the place of mouths. The mystery is how the first one comes; most people say that in the autumn they lay their eggs along the branches and cover them over with a secretion, and in the spring they are hatched; but my belief is that they lay their eggs in the winter-bud, and as the leaf discloses itself the eggs are hatched and these little creatures appear. They also have their enemies, and the grub of the ladybird loves to feed on them. There are other creatures which seem to be sent into the world simply for the sake of devouring the aphis, but they are not often to be found on the rose-tree, though they are common enough on many of the larger trees. The aphis should be killed as soon as it appears, before it has time to increase; if allowed to have its own way, it will soon deprive the plant of its life-sap.

IDA A. SHARPE.

WE are sorry to say that owing to a mistake, the name of the author of "The Development of the Colours of Flowers through Insect Selection," in the June number of SCIENCE-GOSSIP, was omitted. The author of the article is Mr. Edward H. Robertson.

A DAY IN WESTMORELAND.

By J. CHAS. SMITH.

ON a bright morning in the last week of June, being desirous of a day's excursion into Westmoreland, I started by the first train from Penrith to Clifton with my vasculum and boxes for holding shells. The journey by rail only lasts a few minutes, but even in that short time much of interest can be seen. After crossing the river Eamont, which divides the two counties Cumberland and Westmoreland, we have on our left Yanwath Hall, a building, judging from its parapets and battlements, probably dating from the fifteenth century; it was a place of importance during the Border raids in 1715 and 1745. On crossing the river Lowther we have on the left a square tower, Clifton Hall; it was near here that the well-known skirmish of Clifton Moor took place, in the winter of 1745, between the Royalists under the Duke of Cumberland, and the Highlanders. Leaving the train at Clifton station, I took the road over the moor in the direction of Melkinthorpe, the air perfumed by the wild roses that abundantly festooned the hedgerows; the song of birds and the plaintive cry of the lapwing as it swooped down upon the lowland marshes pink with ragged robin and orchids, made the walk seem short and pleasant.

I soon reached Waterfalls Bridge over the Leath, picturesque with its covering of ivy, lichen, harts-tongue, spleenwort, and fragilis, which love the damp limestone nooks of this lovely valley. The limestone is of the Yoredale series, and is principally composed of encrenites, amongst which I noticed a few small fossil trilobites of the commoner kind, and the beautiful lace-like sea mat "Polyzoa," also shells of various kinds, from the large productus to the small gasteropoda or univalves; ripple-marked slabs, showing the annular markings of worms with the sharp ridges made by each turn of the body.

In this valley, under some loose fragments of rock, I found a quantity of *Clausilia rugosa* and its variety *dubia*, *Helix arbustorum*, *Bulimus obscurus* with its shells covered with mud to protect it from its enemies; and the commonest of the *Pupa umbilicata*, *Cochlicopa tridens*, commoner here among the moss than *C. lubrica*, also the well-named *Helix pulchella*, and mollusc *Carychium minimum* carrying its shell horizontally on its back. The best find here was a few full-grown specimens of *Clausilia laminata*, which are rare in this neighbourhood; they were under the fallen branches of some trees; this shell is named from its being marked with plaits or folds. It may interest non-conchologists to know that the Clausilia is so called, because of its having a clausium or door by which the aperture of the shell is closed: the clausium consists of a spirally-twisted thin plate, situated in the last whorl of the shell and attached to the columella or the axis round which the whorls turn.

When the animal wishes to protrude itself, it pushes its door on one side into a groove between the columella and the inner plait, which is held open by the pressure of the animal's body; and when the body is retracted the door closes by its own elasticity.

In an old quarry, and an old quarry is the happy hunting-ground of botanists, was growing Smith's cress (*Lepidium Smithii*), and four varieties of Hypericum; whilst in a disused corner, growing in company with *Orchis maculata*, was *Orchis pyramidalis*, an orchid rare in the Lake District.

The roadsides and woods were gay with *Geranium sylvaticum* and *pratense*, *Habinaria bifolia major*, *Tragopigon pratensis*, and the beautiful greater *Centaurea scabiosa*, which is worthy of a place in the garden; *Epipactes latifolia*, not then in bloom; *Campanula glomerata*, and *latifolia*, *Melampyrum sylvaticum*, *Eupatorium cannalinum*, *Paris quadrifolia*.

The stream running through this valley seems, like many other northern ones, to be the home of the dipper or water-ouzel, its white breast showing as he swiftly flies past with his sharp whistling notes; this bird is a very early breeder, building a large compact dome-shaped nest as early as February, its site often being under a bridge or beside the busy mill-wheel.

Following the path through the fields to Hackthorpe, the only plants worth noting were the pepper saxifrage, *Salans pratensis;* sawwort, *Serratola tinctoria;* and the pretty climbing bittersweet. The *Geranium lucidum* brightened up the old walls with its foliage, which had turned a gorgeous hue from the effect of a long period of dry weather; the little shell *Helix rupestris* was abundant on the wall tops, also a few specimens of *Balia perversa*, so called from its whorls turning the wrong way; this shell is not common in this neighbourhood. *Helix aspera*, so abundant in other parts of England, is very rare in mid-Cumberland, and this part of Westmoreland: I only know of one locality for it. Miss J. Donald of Carlisle also reports it rare, having only found a few specimens in her neighbourhood.

Going through the pretty little village of Hackthorpe, I passed the Hermitage, for many years the home of the late Jacob Thompson, painter of "The Ferry-boat," and other pictures. He was a lover of nature, depicting with such truth the heather-clad hills, that a geologist might say of his pictures, "Yes, that rock represents Skidaw slate," or a botanist, "That plant clinging to yonder cottage wall is *Linaria cymbalaria*, the creeping toad-flax." Then I made my way to Lowther village, passing through a cutting of micacious sandstone thinly laminated in places, and covered over with clay and earth mixed with large boulders striated by the ice-sheets, which rode over a large area of this country in the glacial period; the boulders are principally of volcanic origin. Lowther Park is famous for its ornamental timber, many of the oaks being of great age and size. A decayed beech-tree was evidently the nesting-place of a pair of pied fly-catchers, which fluttered to and fro amongst its branches. This bird is by no means rare in Cumberland and Westmoreland, being found along the banks of the Lowther, Eden and its tributaries. The park is bounded on the north-west by the river Lowther, and here I was fortunate in finding a few specimens of the pearl mussel, *Unio margaritifer*. Following the course of the river through the park, I passed the sweet-scented orchid, Conopsea, with heads three inches long; wood sanicula, yellow mimulas, *Galium boreale*, woodruff, enchanter's nightshade, and on the roots of some fine beeches that interesting parasite, *Lathræa squamaria*, toothwort.

The day was drawing to its close when I reached "the town on the red hill" (Penrith: from the Celtic, pen, a hill, rhudd, red), and in the words of a Cumbrian, Varry well pleased wid my day's take.

NOTES ON THE SPRING OF 1893.

On referring to my notes, I find the year 1874 was the earliest spring for plants and crops in general we have had, till this year. But 1893 beat everything that I can remember; on the the 7th of March, marsh-marigolds and *Ranunculus ficaria* were in bloom; these were followed in rapid succession by *R. bulbosa*, *R. repens*, *R. acris*, *R. auricomus*, *R. arvensis*, and several forms or varieties of water-crowfoot were all blooming, by the 17th of April, while *R. Flammula* was showing buds; the first cowslip was gathered 17th of March, *Lotus corniculatus*, vetches, and many clovers, field-poppies, wild mignonette, campions, and cromwells; the beautiful *Stellaria holostea*, and other stichworts. Honeysuckle, wild geraniums, burnet, and wild rose, avens, potentillas, hawkweeds, camomiles, eight species of speedwells, plantains, and orchis, and many other plants were in bloom the third week in April, which is much earlier than usual.

May or hawthorn in bloom April 17th; May 11th is the next earliest date here. In the gardens the almond-tree was in bloom the last week in March; lilac and laburnum was blooming April 15th, which is quite a month earlier than previous dates. The first bird to arrive was the chiff-chaff, March 7th. This is generally the first of the migratory birds; the 15th of the month is about the time the first are seen. Willow-wrens or warblers, the last week in March; redstarts, 7th of April; wheatear and stone-chats, about the 12th; first swallows, April 15th; cuckoo first heard April 18; house-martins arrived May 2nd; swifts, May 10. I find, also, that entomology specimens are not behind in this great race for life; they, like everything else, seem in a hurry to make the most of this fine spring, that has given us less rain and more sunshine than anyone seems to remember. I saw on March 9th a very fine specimen of brimstone butterfly, and was pointing it out to a person that was with me, when a blue titmouse darted from a tree, gave chase to the butterfly, and snapped it up. I had not seen this done before. Caterpillars of the tiger-moth were, the second week in March, plentiful; very shortly whites, both large and small, made their appearance; tortoiseshells of both species, also the painted lady, which, by the way, are not very highly painted, a great deal of the painting appears to be rubbed off from early specimens. I consider all earlies to be hybernated specimens; the peacock, meadow-browns, and some ringlets, and two species of blues, which, I believe, were the common blue and the holly blue; all this number were seen by me at the end of the third week in April. A great number of moths also made their appearance earlier than usual this spring. But the cinnabar moth being a day-flier, is very conspicuous among them, and I never fail to note its appearance. I have such dates as May 10th, 12th, 13th, 14th, 16th, &c., this year; I saw three on the morning of April 15th, and have seen them nearly every day since that date. The fine, dry spring would seem unfavourable to the helices, but they are very plentiful, and take advantage of damp evenings and the little showers we have, for getting abroad. I was in a rather neglected garden one evening after a shower, early in May; I found *H. nemoralis* so plentiful on the gooseberry-trees, it appeared that the one object of the trees must be to produce snails, about forty various forms were secured in a quarter of an hour. Speaking of trees reminds me of other trees; many plum-trees, in sheltered situations here, have very large crops of fruit, and one tree that I know, which is trained to a wall, has a large crop of plums; and on this same tree there are about twenty twins or doubles—two plums growing on one common stalk—in some cases they are united, in others they are distinctly separate. I am very much connected with fruit and fruit-trees, but I do not remember seeing anything like it before.

Hy. Blabey.

THE SENSES OF INSECTS.

By W. H. Seyfang.

SIGHT.—The eyes of insects are situated in the head, and are generally (in the adults) five in number; two large compound eyes (oculi), and three small simple eyes (ocelli). The occuli are placed on the sides of the head, and the ocelli generally above and between them. Each oculus is made up of a large number of hexagonal facets; of these the house-fly has about seven thousand in each eye, and a butterfly, over seventeen thousand. It might be inferred that every object presents to an insect a multitude of images, but as we are not in the habit of seeing double, I should think that the nerves supplying each facet join up to form an optic nerve, which perhaps carries one impression to a retina. Muller says of an insect's eye, that "each individual facet of the compound eye can survey but a small space in the field of vision, each only contributes to the perception of all things within it. Each separate one does not at the same time see all such objects, but conveys its impression to the nervous filament with which it is supplied, and the latter being united in the great optic nerve, a common and distinct image is ultimately produced." Of eyelids insects are wholly destitute, but the cornea in some is covered with hairs to keep the eye free from dust or other obstacles. Insects are not long-sighted, but the eyes of some are beautifully adapted to their mode of existence. In the whirligig beetle (*Gyrinus natator*), for instance, the two oculi are divided into four, one pair to look upwards through the water, and the other downwards.

In the size and number of the visual organs, insects have the advantage over all the higher forms of animal life, but in number they are surpassed by some of the lower forms, such as some scorpions with twelve, leeches with ten.

Hearing.—Linnæus doubted whether insects hear at all. Other naturalists have thought that the antennæ are the organs of hearing. My own opinion is that insects perceive sounds by the sense of touch, that the vibrations created by sound are communicated to the antennæ, but that the latter are organs of touch, not of hearing. For instance, if a butterfly be resting on the ground with the antennæ outspread, and some noise be made on the ground a few yards off, the vibrations produced by this sound would be communicated to the antennæ, and the insect would fly away. It would not take long for the butterfly to receive this warning, as sound travels at the rate of about 1142 feet in a second. Thus, the vibrations which affect our organs of hearing would be, in an insect, communicated to the organs of touch.

Feeling.—The nervous system of an insect consists of a double ventral chain of ganglia (two ganglia in each segment) united by commissures. The first two ganglia are above the œsophagus, and are united to the second two by commissures passing round the œsophagus, and termed the œsophageal collar.

The antennæ are thought to be the principal organs of touch, though some think them to be organs of hearing, or perhaps smell; but neither of these two seems probable. In reference to the question of an insect's feeling when injured, I fully believe that they do feel it, although some author quotes a case of a wasp which had been deprived of its abdomen, regaling itself on some red syrup, which gathered into a bead at the hinder end of the thorax. If an ichneumon fly pierces a caterpillar, the latter seems to wince when the wound is made; surely this would indicate that the creature felt the prick. As yet, however, I think that nothing has been made out with certainty as to the feeling of insects.

Smell.—The sense of smell is well developed in insects. Those useful insects, the carrion-beetles, are, it is said, attracted to their unpleasant prey from surprising distances; and butterflies and bees smell their favourite flowers from heights of over sixteen feet. Huber tells us that, having put some honey in a room with the window opened just wide enough to admit them, he found some bees and a butterfly assembled round it; and collectors of moths put honey on the trees, generally with success. Ants are also very sensitive to smell, for we are told by Lieutenant Stairs that in Africa no cockroach can die in a corner without the ants finding it.

The position of the organ of smell has not with certainty been ascertained. Some think that the antennæ fulfil this office, but this does not seem probable. Huber thought that it is situated in the head and near the mouth, for he says that, having approached a drop of turpentine to the mouth of a bee, the insect started from the honey on which it was feeding, and would have flown away but for the removal of the offence.

Some think that the jointed antenniform appendages situated on the hinder part of the abdomen, are organs of smell; and I might also add here that these have been connected with hearing; but I believe that they are purely generative.

Taste.—The organ of taste is situated in the mouth, and is assisted by one or two pairs of salivary glands. This sense is also well-marked Many caterpillars would rather die of hunger than eat anything but their natural food-plant. It has been asserted that bees do not taste, as they seem to mix their honey from different plants indiscriminately, but the bee's motive is probably to take what best gratifies the offspring of the hive.

Again, many insects are not particular in their choice of water, and seem to drink impure and pure water with equal relish; but it is said that bees and butterflies drink impure water only in the spring for the sake of the salts which they contain.

The shape of the tongue in insects varies considerably. In dragonflies and grasshoppers it is rounded, in wasps forked, in bees tubular, in diptera tubular and fleshy, and in butterflies and moths it is divided into two parts which join together and form a tube. The salivary glands open by tubes into the mouth, gullet, or stomach, according to the nature of the food. The gizzard is generally furnished with teeth, which assist in the process of digestion after the food has been mixed with the saliva and swallowed.

Instinct.—Kirby considered insects' instincts as "unknown faculties, implanted in their constitution by the Creator, by which, independent of instruction, observation, or experience, and without a knowledge of the end in view, they are impelled to the performance of certain actions tending to the well-being of the individual and preservation of the species."

It is instinct which directs the butterfly to flowers where she takes her pleasure, and then to leaves where she lays her eggs, but in this case the instinct is probably aided by smell. It is instinct which enables the caterpillar to spin its cocoon, or to suspend itself head downwards, preparatory to casting its last skin and appearing in the garb of a chrysalis. Ants are guided by instinct to build their nests, as are also bees and wasps.

Sharon Turner in the "Sacred History of the World," vol. iii., says that "the actions and habits of the insect world display the same kind of animal mind and feeling which birds and quadrupeds exhibit. If there be a difference, it is not to the disadvantage of insects, for ants, bees, and wasps, and especially the smallest of these, ants, do things, and exercise sensibilities, and combine for purposes, and achieve ends, that bring them nearer to mankind than any other class of animated nature."

The keeping of aphides by ants is an illustration of this. Huber says that the humble-bees drill a hole through the calyx of narrow tubular flowers. As regards the means by which insects communicate with one another, it seems to be done by the antennæ; and this will be plain if a nest of ants be watched for some time, when the workers seem to be conversing in antennæ language.

The ant is certainly a wonderful insect. It is, I believe, the strongest being of its size alive, and its reasoning power is enormous. Mr. Darwin says of the ant, "The size of the brain is closely connected with the higher mental powers, and the cerebral ganglion of ants is of extraordinary comparative dimensions. Still, cubic contents are no accurate gauge. There must be extraordinary mental activity, with extremely small absolute mass of nervous matter. It seems as if the fineness of the quality was more important than even its quantity. The wonderfully diversified instincts, the mental powers and affections, exist with cerebral ganglia not so large as a pin's head."

Again, he says that the brain of an ant "is one of the most marvellous atoms of matter in the world, more so even than the brain of man." I think that I had better conclude with the following words of an American writer, with whom I certainly feel disposed to agree: "Everything which surrounds us is full of the utterance of one word completely expressive of its nature. This word is its name, for God even now (could we but see it) is creating all things, and giving a name to every work of His love, in its perfect adaptation to that for which it is designed. But man has abused his power, and has become insensible to the real character of the brute creation, still more so to that of inanimate nature, because in his selfishness he is disposed to reduce them to slavery.

"We find the animal world either in a state of savage wildness or enslaved submission. It is possible that as the character of man is changed they may attain a midway condition removed from both. As the mind of man acknowledges its dependence on the Divine Mind, brutes may add to their instinct submission to human reason, preserving an unbroken chain from our Father in heaven to the most inanimate parts of creation. . . . Everything will seem to be conscious of its use, and every man will become conscious of the use of everything."

OBSERVATIONS ON THE MARSH TITMOUSE.

EARLY in the spring of 1891, my son, who was eighteen years of age, and a bit of a naturalist, came home one day and said he had found a fresh-pecked hole in a very rotten tree, which he thought was the work of the lesser spotted woodpecker. About a month later he went to the tree and found a large hole about twelve inches deep, with a nest in it; the hole in the tree was much too small to put his hand in, so he cut a piece of the tree away on the opposite side, to reach the nest, which had nothing in it. He replaced the piece of wood and secured it by binding a twig round the tree, but he was surprised to find such a large hole made, and not a chip to be seen lying on the ground. A few days later he looked at the nest, and there was one egg, which he brought home. I suggested it was the egg of the coal-titmouse. In three days he went to the tree again, and removing the piece of wood, found the bird on the nest with three eggs; he carefully examined the bird, thinking that would be the last he should see of it, and brought the eggs home, and as I have specimens of most of the tit family, the marsh titmouse was readily selected as being like the bird he took from the nest. In a week he went to the tree again, and found the bird on the nest with seven eggs; he brought the eggs home, and there were not any more laid that year.

Last April he went to look at the tree again. He found the tree was broken in two at the weak place caused by the bird, and another hole begun lower down. Some time after, I went to the tree, and found a hole about six inches broad and about nine inches deep, and the bird in the hole pecking away. I put my hand over the hole, thinking, Most likely you are the same birds that were here last year, and don't object to be caught; I will catch you. I rapped the tree with my stick, expecting it instantly in my hand, but it did not come. I rapped again and kicked the tree with my foot, took my hand from the hole; but do what I would I could not make the bird leave the hole, so I went a distance away and waited to see what would happen. In a few minutes the cock-bird appeared on the scene; but instead of going to the hole in the tree, he flew to the ground, picked up a chip, gave a shrill note, and flew away with the chip. The hen put her head out of the hole, dropped some more chips and returned to her work, and I went on. About a month later we went to the tree—I might mention it was in a small wood about a mile-and-a-half from my house; we cut a hole in the opposite side of the tree, to get the nest, which contained seven eggs. We took the eggs, replaced the piece of wood, and went home. Next week my son was by the tree again. He thought he would have a look at the nest. To his great surprise he found there were seven more eggs; he brought them home, and going to the nest ten day's later, found another seven eggs. I know I shall be severely censured by some of our readers, but my curiosity was aroused, and it seems to clear up a doubt that has long existed in my mind, that birds have the power to lay more eggs or sit as they choose. I have on several occasions taken the eggs from a nest which would have been sat upon the next day; and about a week after I have found another five eggs in the same nest. However, he brought the seven eggs home, and in a fortnight there were four egg-sittings, making a total of thirty-five eggs taken in two seasons. All the eggs except three are still in my possession. This year there is another nest in the same tree, which we do not intend to disturb.

H. BLABY.

Brackley, Northants.

SCIENCE-GOSSIP.

THE past month has been one of unusual turmoil for scientific circles, stirring even those profound and tranquil depths which the waves of current politics are powerless to ruffle. By electing Sir Henry Howorth to a Fellowship, in accordance with the original nomination of the council, the Royal Society has undoubtedly saved its dignity. The annual election of the council's nominees has been suffered for so long to degenerate into a perfunctory routine that any breach of the custom, especially one involving the invidious distinction of striking a single name off the list, should have been carried out with the greatest delicacy and caution.

ALFRED RUSSEL WALLACE has been admitted into the sacred ranks of the Royal Society. In 1858, before Darwin had published a print of the great theory he was compiling, an essay by Mr. Wallace, then a comparatively unknown man, forced his hand, and compelled him, unless he wished to be anticipated, to send in to the Linnean Society all the work that he himself had done in the same direction. Mr. Wallace's essay was entitled, "On the Tendency of Varieties to depart indefinitely from the Original

Type," and although far smaller in scope it contained essentially the germ of Darwin's "Origin of Species," which did not appear till the following year.

THE variation of species when left to itself was exemplified by Dr. Bowdler Sharpe at the Royal Institution, in his third lecture on the geographical distribution of birds. It was shown that the long separation of the British Isles from the Continent had already produced a distinct modification in certain types of birds common to both, the plumage of indigenous birds having become in general duller than that of their Continental representatives. This is the case, for instance, with the Scotch grouse, while the alteration is especially marked in the case of the coal-titmouse and the long-tailed titmouse.

A WARM discussion has been going on in the correspondence columns of "Nature" with regard to certain discoveries of flightless birds made by Mr. H. O. Forbes in the Chatham Islands, and the deductions which he drew from this fact in a paper read before the Geographical Society, and printed in the "Fortnightly Review" for May. Mr. Forbes has evolved a theory of an Antarctic continent joining New Zealand originally with the surrounding islands, and the existence of similar kinds of flightless birds on more than one of these islands is a strong link in his chain of evidence. When the ice age split up the continent, its inhabitants branched off in different directions, and hence we find certain rare species such as the genus Aphanapteryx existing in regions so far apart as Mauritius and Chatham Islands. Mr. Russel Wallace combats this view energetically, and asserts that the continued existence of such ill-protected creatures as wingless birds is the best possible proof that their domains were always islands, as on any mainland inhabited by carnivora their extinction would be speedy. His idea is that the common ancestor of the different kinds of Aphanapteryx was a bird of flight, and that the degradation took place simultaneously and independently on the different islands. He protests against the invention of so tremendous a hypothesis as an Antarctic continent to account for an apparently simple fact. Mr. Forbes differs about the simple fact, and considers the notion of parallel degradation a still more tremendous hypothesis. He justifies his deductions on the analogy of Professor Alfred Newton's theory to account for the dodo of Mauritius and the solitaire of Rodrigues. If Professor Newton could invent a dry land hypothesis without molestation, why not he also? Moreover, he has shown that the wingless Rallidæ are by no means ill-protected, and that in the long reeds of the marshes which they inhabit they can make their security complete.

WASPS IN DEVONSHIRE.—It seems probable that this year Devonshire people may look out for a plague of wasps. The number of solitary individuals observed this spring hunting along the high banks of the picturesque lanes so common in Devonshire for suitable places to build their nests, was certainly above the average, and it is to be presumed that the greater part of them will succeed in forming colonies. These visitors will be all the more unwelcome from the fact that last year they were far and few between, and a wasp's nest was an actual rarity. Their sudden reappearance may possibly be owing to the mildness of the winter in comparison with those which preceded it, and which has enabled a larger number than usual to survive until the spring. Unless something is done in the way of destroying the nests, it looks at present as if the cider orchards were likely to suffer considerably in the autumn.

NATURAL HISTORY MUSEUM AND LIBRARY.—The Committee of the Haslemere Micro. and Nat. Hist. Society will gratefully acknowledge any kind contributions of specimens, books, etc., towards the formation of a museum and scientific library. Communications should be addressed to Mr. Chas. Pannell, Jun., Hon. Curator, H. M. and N. H. S., East Street, Haslemere.

THE June number of "The Annals and Magazine of Natural History" contains the following articles: "On New Species of Histeridæ," and notes on others by G. Lewis; "On New and Little-known Tessaratominæ of the Order Rhynchota," by W. L. Distant; "The Range of Placostylus: a Study in Ancient Geography," by C. Hedley; "Note on Mesoplodon bidens," by the Hon. Walter Rothschild; "A Contribution to the Knowledge of the Genealogy and Classification of the Crustacea," by Prof. Karl Grobben; "Report upon the Stomatopod Crustaceans obtained by P. W. Basset-Smith, Esq., Surgeon, R.N., during the Cruise in the Australian and China Seas of H.M.S. *Penguin*, Commander W. U. Moore," by R. I. Pocock.

MR. HILDERIC FRIEND is the early bird who catches the worm. Here he is again with more newly-discovered species described and illustrated in two brochures reprinted from the "Proceedings of the Royal Irish Academy:" viz., "On a New Species of Earth-worm," and "On Some New Irish Earth-worms." He also sends us "Studies of British Tree and Earth-worms," reprinted from the "Linnæan Society's Journal."

GREENWICH OBSERVATORY.—The annual visitation of the President of the Royal Society and the Board of visitors to the Royal Observatory at Greenwich, took place recently. In a practical and scientific aspect the present visitation is the most satisfactory of any yet made, and this mainly because of the evident advance in the means of astronomical researches beyond the fundamental observations specially established for nautical purposes. The Americans are spending large sums of money in making the United States Observatory a showhouse for the world; but, as the originator of Royal Observatories, and in former days possessing the only institution of its class, there is surely no reason why Great Britain should fall away into the second rank. The immediate chief impediment is the want of ground space. The report presented to the Board shows in a technical way the progress of the past year, and indicates the advances going on. In the fundamental equipment, the Greenwich Observatory is not behindhand, and the new 28-inch refractor, the mounting of which is all but completed, is slightly in advance of the American equipment with a telescope of 26 inches. The site for the erection of the proposed universal transit-circle is being pegged out in a way that illustrates forcibly the cramped nature of the remaining available ground. Of the full results of the Greenwich Observatory all may well be proud. Some are unique, as, for instance, the continuous records from 1857 to the present day of a single instrument—the Transit Circle. No other country has such a perfect series, and in the investigations on the variations of latitude undertaken at the Observatory at Boston, Massachusetts, the English record has been employed.

Of the work done at the Observatory in the past year, we may note that with the astrographic equitorial 722 photographic plates, with a total of 1812 exposures, were taken on 161 nights, of which only 116 have been rejected for various defects, leaving a large number of perfect records in contribution towards the universal star-map in progress amongst the nations.

The photographing of the sun during the past year has presented unusual features on account of the maximum activity of the solar outbursts, which still continues. Within the past month a group of seven or eight large spots appeared, and is still visible, with other groups in different places on the sun's disc. By the Dallmeyer photo-heliograph, photographs have been taken on 180 days, and 410 views have been selected for preservation, besides 22 photographs with double images for determining zero positions. The photographic telescope presented by Sir Henry Thompson has also been in use since the beginning of this year, and of the plates obtained on 89 days, 158 have been selected. Thus, between the two instruments, a record of the state of the solar surface on 220 days has been secured. For 1892 the Greenwich photographs selected were for 197 days; and if those are added from India and the Mauritius on 165 days, a total of 362 out of 366 has been reached, giving all but daily information of the sun's superficial condition. The diagrams which have been prepared of the coincidences of the daily magnetic variations with the daily intensities of the solar eruptions forcibly suggest, if they do not indeed indicate, the distinct connection between the two phenomena, the more prominent maxima of the curves being singularly demonstrative.

The Meteorological Department has a full record, as usual. The hours of bright sunshine in 1892 were 1277, or seven hours below the average; the rainfall was 22·3 inches, being 2·2 below the average of 50 years. With regard to the recent drought, the sunshine registered in March and April is phenomenal, being respectively 155 hours and 231 hours; the greatest previous records for these months in sixteen years from 1877 being 141 hours in March, 1880, and 196 in April, 1892. The greatest values for any month in the period referred to are 277 hours in July, 1887; 267 in June, 1877; and 237·8 in May, 1882; and, considering the ratios of sunshine to the total time of the sun above the horizon, the April of the present year may be looked upon as the sunniest month on record. For the 72 days from March 5 to May 15, the total rainfall was only 0·246 inch; the average for the corresponding period being about 4 inches. There is no similar dry period since 1841. It is remarkable that previous to the drought there was a longer rainfall than usual. Between the 1st of February and the 4th of March, heavy rain fell on twenty-five days, to the total of 3·03 inches, the average rainfall for the corresponding period being about 1·67 inch. For the annual trial of chronometers forty-eight were sent in, and of these twenty-five have been purchased for the Navy.

For the rest of the visitation the interest centres in the advancing of physical researches in connection with the daily fundamental work of the Observatory. The new Physical Observatory is growing piecemeal. The central octagon is a fact; but of the four rays which will convert it into a cruciform structure, the south wing had its building operations begun in November, but these were arrested in March by the want of terra-cotta. The Admiralty have now authorised the outlay for the north wing, and the completion of the central octagon by the erection over it of the Lassell's dome. The new museum has at length been fitted with the necessary glass cases, and is nearly ready for the reception of the portable instruments and apparatus. In the new Library four cases of bookshelves have been added, and two large cases for the 10-inch solar photographs and the 16-inch stellar photographs for the Astrographic Chart, which are rapidly accumulating.

In preparation for the erection of the new 35ft. dome on the south-east tower, the old cylindrical dome was dismounted last winter, and the mounting of the new dome, commenced in December, was completed at the end of April. Preparations for an installation of electric lighting have been made, and the plant has been supplied. It is proposed to set up the gas engine, the dynamo, and accumulators in the new south wing of the Physical Laboratory. On the possible disturbances of the magnet instruments, some interesting experiments have been made, ending in the provision of three consecutive iron shields over the dynamo, by which simple means the influence is reduced to practically *nil.* The present report, like its predecessors, abounds in passages which cannot do otherwise than add to the impressions of the inconvenience and inadequacy of the existing site and buildings, and of the consequent hampering influences on the performance of the Observatory work.

MICROSCOPY.

PRESERVATION OF MELICERTA RINGENS.—In May 1889, and also in May, 1890 you inserted some notes from me on the continued preservation of this organism; and it will, I think, interest some of your readers to hear of a still greater success in this matter. From the time of my last note to the present I have always been able to find this beautiful rotifer in my aquarium, making the total recorded period five years. At times they have been very scarce, at others far to numerous to count. A change of residence of rather more than 200 miles, caused a break of eleven weeks in the hitherto continuous existence of my aquarium. During the time it was perforce empty small pieces of the old plants were preserved in a 2lb. glass jar, these being *Ceratophyllum verticellatum*, *Fontinalis antipyretica*, *Riccia fluitans.* During a greater part of the time I had also *Chara Braisnii*, also *Lemna minor* and *trisulca.* The stickleback lived with me over 2½ years; since his lamented decease the vertebrate occupants have been two small gold-fish. In the whole period since my last communication the water has only been twice changed, the last time only from the manifest difficulty of transportation. At the bottom of the aquarium I have first clay, then coarse sand; this was undisturbed. About three weeks ago, when I re-established my aquarium, putting in water (from the New River Co.), pieces of the old plants, and two fresh gold-fish, the melicertæ were very few, I could only be certain of at most two or three; now they are very numerous, so that it is certain that under favourable conditions their rate of increase is very rapid.—*J. W. Measures, M.R.C.S., Hornsey.*

A DOUBTFUL SPECIES OF THE GENUS ŒCISTES.—Since the appearance of his article in last month's SCIENCE-GOSSIP (p. 130), Mr. Tugwell has been good enough to send me living specimens of this creature, which I have no hesitation in referring to *Œ. ptygura.* I gather from Mr. Tugwell that the unusual length of the foot is a character only exceptionally presented, while I infer that the strongly-marked corrugation of that organ, to which he alludes, is also a merely temporary condition, since the specimens examined by me did not exhibit this deeply-wrinkled appearance. I have suggested to Mr. Tugwell that he has very probably mistaken the scarcely-prominent "chin" of this species for an unpaired ventral antenna, seeing that he describes it as "seated upon a small prominence, the upper surface of which is ciliated." The real ventral antennæ are a pair of widely-separated minute papillæ (similarly situated to those of *Œ. crystallinus*, and other species of the genus), from each of which springs a very thin pencil of apparently not more than two or three very long, but extremely delicate, setæ. These sensory tufts, placed one on each latero-ventral aspect of the trunk, are best discerned in the retracted condition of the animal, when they happen to be seen in profile; occasionally, it is possible, in a direct ventral view, to glimpse both tufts at once. From their exceeding delicacy, these ventral sense-organs are scarcely noticeable, except when specially looked for, hence it is that their presence has not heretofore been recorded. I think it probable that all the species of Œcistes, without exception, will ultimately be found to possess both a dorsal and paired ventral antennæ, although one or other of these have not yet been detected in several of the forms. Certain it is, that *Œ. crystallinus* has a minute dorsal antenna, of almost filmy delicacy, in the normal position, and *Œ. intermedius* possesses a similarly-placed dorsal sense-organ; and no doubt further research will demonstrate the existence of both dorsal and ventral antennæ throughout the genus.—*Percy Thompson.*

ZOOLOGY.

THE GOLDEN ORIOLE IN DORSET.—My son shot a fine specimen of the golden oriole one day about the close of May. It was running along the branch of a tree in a small copse on my glebe in the dusk of the evening, and, not seeing it clearly, he took it for some small animal. It was making its usual curious warbling or chattering, which my son had not heard before. Since that time he has heard another in the same place, but has not seen it. The one shot is in the hands of a very clever naturalist, Mr. Howlett, of Newmarket, who is stuffing it for me, and is sure to do it well. It is, I believe, the male bird. If any others appear they will be watched, but not molested. No nest has been found.—*Jas. Lukin.*

PARASITES FOUND IN THE LUNGS OF RANA TEMPORARIA.—On dissecting a frog some time ago, I found both lungs swarming with vermiform parasites, varying from $\frac{1}{10}$ in. to ½ in. in length. Before being killed, the frog appeared quite healthy. The characteristics of these worms are as follows. 1. A larger form, varying from ⅛ in. to ½ in. in length, anterior and blunt, terminated in a sucker perforated by the mouth. Posterior end tapering nearly to a point, and terminated by the anus. This form was found only in the bases of the lungs. 2. A smaller form, varying from $\frac{1}{10}$ in. to ⅛ in. in length. Both ends blunt, no reproductive organs. Found in the apices of the lungs. *General Characters.*—Digestive tract seen through body wall appeared dark red, and was found on examination to contain blood. The larger forms appeared to be all females, and contained many ova. Can any of your readers inform me whether this parasite is *Rhabdonema nigrovenosum*, and whether it is described in any standard work?—*W. H. Seyfang, St. Peter's College, Cambridge.*

BOTANY.

MR. F. H. ARNOLD, in the June number of this paper (SCIENCE-GOSSIP), records *Geum intermedium* and *G. rivale* as having been found in an unusual situation. I can record a similar instance, for when once out with some friends botanizing on the chalk downs near Mere, Wilts, in a small thicket on high and dry ground we found the two species growing together. On the same hills we were also fortunate in finding several plants of that rare thistle, *Carduus tuberosus*, which was new to that locality; in the far distance, however, we could see the dark outline of Great Ridge Wood, near Boyton, in the same county, where it was first found by Mr. A. B. Lambert in the early part of this century, but I am now told that it cannot be found there.—*Wm. Herridge, Bratton S. Maur, Somerset.*

FLOWER of Foxglove showing central proliferation, gathered on Baddesly Common, near Romsey, June 10th, 1893. The blossom in question was the lowest on the spike, which must have been of great length, but the rest, with the exception of one apparently normal unripe seed-vessel, had been cut off before the writer discovered the plant. The corolla was about double the usual size, but was enlarged laterally more than vertically, giving a peculiar appearance to the flower. The calyx possesses six sepals, the extra one, which is very small, being inserted by the side of the small upper sepal, itself unusually narrow. On the other side is a large sepal cleft half-way down. Excepting the central proliferation, the most remarkable peculiarity of the flower is the possession of five stamens. Two of them have their anthers united, whilst the other three are entirely separate from one another. The base of the additional stamen, which like the rest partially coalesces (as in the normal flower) with the corolla, is in front of the blossoms, i.e., the side remote from the ordinary unpaired sepal. The stamens with the conjoined anthers belong to one and the same half of the flower, being in fact adjacent long and short stamens. The length of all the stamens is, however, approximately equal. The only peculiarity remaining to be noted is the existence of a spike of flower-buds about 1½ inches long in place of the pistil. It closely resembles the normal undeveloped flower-spike, and would not call for notice except on account of its unusual position.—*John T. Kemp, Romsey.*

GEOLOGY.

THE "Geological Magazine" for June, contains the following articles: "Eminent Living Geologists," Prof. J. Prestwich, D.C.L., LL.D., F.R.S., F.G.S., (with portrait); "On Fossils applied as Charms and Ornaments," by the Editor (with woodcut); "Woodwardian Museum Notes: Abnormal Forms of Spirifera Lineata," by F. R. Cowper Reed, B.A., F.G.S., (illustrated); "On a New Species of Discites," by A. H. Foord, F.G.S., and G. C. Crick, A.R.S.M., F.G.S., (illustrated); "On the Thickness and Expansion of Marine Deposits," by the Rev. O. Fisher, M.A., F.G.S., (illustrated); "Notes on the Devonian Fishes of Campbelton," by R. H. Traquair, M.D., F.R.S., F.G.S.; "The Shell-beds of Moel Trypen," by Prof. J. F. Blake, M.A., F.G.S.; "Foraminiferæ Limestone from the Grenadine Islands," by A. J. Jukes-Brown, B.A., F.G.S.; "Notes on the Tuscan Archipelago," by C. S. Du Riche Preller, M.A., Ph.D., (illustrated); "Was the Deposit of Chalk Contemporaneous?" by G. Abbott, M.R.C.S.; and "Glacial Submergence, by James D. Hardy, Esq.

POLYPODIUM CALCAREUM.—Under the heading of "Geology" on page 141 of SCIENCE-GOSSIP for June appears a notice by Thomas Jones of Newport, in which he expresses surprise at finding *Polypodium calcareum* on the Old Red Sandstone. A reference to "The Herefordshire Flora," gives as one of its habitats "among loose stones at the Red Daren, Longtown." The geological map gives this district as Old Red Sandstone, not notifying any concretions of cornstones. It must be borne in mind that cornstone contains a certain amount of calcareous matter in its formation, so much so that there are several isolated localities in Herefordshire, where calcareous deposit has formed on grasses, mosses, &c., from water passing over cornstones. This is conspicuous on a very large scale at Moccas. The body of the church at Moccas is built of calcareous tufa, with the sole exception of the doors and window-joints, sills, and arches. It is a matter of surprise to me, therefore, that *P. calcareum* is not more common in Herefordshire on the Old Red, especially where cornstones are interspersed in it.—*H. C. Moore, Hereford.*

NOTES AND QUERIES.

THE INSECT HOUSE AT THE ZOO.—There is no part of the Zoo which at this particular time of the year more demands a visit than the glass house in which the moths and butterflies of the tropics are entering upon a London existence. Like everything else this year, they are a little before their time, the hot sun of the last few weeks having drawn them from their cocoons and shortened the period of their dormant state. A bulletin of their births and deaths might, we think, with advantage, be published in the daily press, for there are many to whom the arrival of the Indian moon-moth or of the great Atlas is an event of at least equal importance with the birth of Mrs. Jones's twins. There is no delusion greater than to suppose that these beautiful creatures can be seen as they really are in the glass cases of the collector. Above the cages in the Zoo "butterfly-farm" there is nearly always a small case containing a dead specimen of the live insect that is within. Let who will compare them, looking at the bleached wings of the one, its dead and laid-out appearance, and then at the brilliant colours of the other, its graceful attitudes, with wings spread, wings closed, or wings half-folded, now hanging, now poised. Their homes are as appropriate as can be—generally glass boxes filled with moss or grass, fitted with miniature tree trunks and branches, and shady places where the night-moths may avoid the mid-day sun. —*Westminster Gazette.*

MAN AND TOAD.—Mr. H. M. Stanley relates some curious African legends in the "Fortnightly." One of them undertakes to explain the origin of the human race. It seems that at a remote time the principal powers in the universe were the Moon and a Toad. They held philosophical and friendly conversations about things in general, till they conceived the idea of making man. Then arose a difference of opinion. The Moon wished to create man and endow him with her shining qualities, but the Toad was determined to make the experiment. So, taking a mean advantage of the Moon when she was soaring majestically in the sky, the Toad evolved man and woman from his internal economy. Naturally the Moon was enraged when she found she had been anticipated, and in her anger she destroyed the Toad, but took a benevolent interest in the creatures which had been brought to life. The man and woman thrived under the guidance of the moon in their domestic affairs, till one fine day they found that luminary superseded by the Sun. Here the legend becomes rather mixed, for why the Sun should have remained in the background all this while is unexplained. However, if the legend is rather weak in its astronomy, it is strong in the doctrine of evolution. It is not pleasant to think that we are descended from the Toad, and for choice most people would prefer the monkey; but it must be allowed that the African legend shows how very antique is the germ of the Darwinian theory. We have been flattering ourselves that this was the outcome of an intellectual process in a highly developed civilisation, and lo! Mr. Stanley discovers it amongst the folk-lore of Central Africa.

ANOTHER TOMTIT'S NEST.—Singular as it is, I doubt whether Mr. Simcox Lea's nest is so remarkable as one I have here. The striking-post of my entrance-gate consists of an iron column tapering upwards, solid for 20 in. from the base, but hollow thence to the top, with a rectangular opening 6 in. high by 1 in. wide, beginning at 2 ft. 2 in. from the base, and used for the admission of the bolt of the gate. The inside diameter of the hollow space within the column is about 2½ in., with the result that there exists a kind of cup 6 in. deep below the opening the bottom of which cup is 8 in. or a little more under ihe bolt when shot. In this cup, for upwards of twenty years past, a pair of tomtits (how often the same pair is unascertainable) has annually nested, and, except in one instance when a cat destroyed the sitting hen, the majority of the young tits have thriven and flown. The bolt is withdrawn and replaced with considerable noise at least thirty to forty times daily, but the parent birds wholly disregard both the motion and the noise. This year and now, we have, so far as they can be counted, seven young tits hatched out and likely to fly within a week; but how these young birds or their predecessors contrive to reach the opening of escape, I have never been able to discover. Eight years ago, the annual addition of wool and hair made to the nest, and the accumulation of bones and débris of young birds which had died or failed to escape, had filled the hollow cup to such a point, that there was risk of the bolt injuring the sitting hen, and I therefore cleaned it out; whereupon, the following year, a pair of tits recommenced from the bottom, and the process of filling it up has again arrived so far that I have this morning been able to insert my finger into the mouths of the fledgelings, and must therefore, when they are gone, again clear out the cup.—*J. H. James.*

HONEY-DEW.—We came across a rather curious experience yesterday. Walking from Kingston-on-Thames to Hampton Court through the recently opened Home Park we found to our surprise that our skirts were getting covered with a peculiar sweet sugary substance resembling diluted honey. The gardener at Hampton Court informed us that it was Honey-Dew from the limes. Is this so?—*F. C. Faux, Fairmead, New Malden, Surrey.*

THE CHAMELEON.—Can any reader of SCIENCE-GOSSIP give the cause of the power that the Chameleon has of changing its skin to assimilate its surroundings? I was watching one the other day which had been brought from Algiers. When I first saw it the colour of the little creature was almost black, but upon being placed on a myrtle, the leaves of which were young and of a bright green, its body gradually began to take a green hue, and in a short time it resembled the tender green of the young myrtle; of course this is for protection, one of those wonderful contrivances of nature possessed by many animals and insects to protect themselves. But how does the chameleon do it? When placed upon a stone-coloured wall it took that colour also; but when removed to a piece of bright blue paper, it was not clever enough to become blue. Besides this it has the most wonderful and very wicked-looking eye, which it seems to be able to roll all round its head, and also squints, one eye looking one way, the other in an opposite direction, so altogether an interesting little animal and worth keeping as a pet, though I am afraid they do not live long in confinement.—*M. A. H.*

BIRD'S EGGS.—Some time since I read a query in SCIENCE-GOSSIP about the mysterious sucking of certain eggs, and I do not remember the point being cleared up. I have noticed the fact again this spring in such a marked manner that I again draw attention to the subject. The nests robbed, to my knowledge, are blackbird, thrush, shrike, bullfinch, chaffinch, linnet, greenfinch, white-throat, hedge-warbler, sedge-warbler, pied-wagtail, wren, reed-bunting, yellow-bunting—generally before the full clutch is complete. What bird or animal can we accuse?—the jay, rook, field-mouse? The old German legend says of the cuckoo:—

> "He sucks little birds' eggs
> To make his voice clear."

I should be sorry to accuse this bird without sufficient evidence, but I have often seen the male cuckoo in the same locality as the plundered nests. The female bird only makes a kind of gurgling sound

—not unlike the bubbling noise from a hookah-pipe—*and never utters the ordinary cry.* It is believed that the males predominate in the proportion of five to one at least. I may add that at the South Kensington Museum a fine lot of cuckoo's eggs, with the clutches they were taken with, is recently on view in a case at the back of the Darwin statue on the ground-floor. I have seen the egg this season in the wagtail's, meadow-pipit's, sedge-warbler's, hedge-warbler's, white-throat's, greenfinch's, and bullfinch's nests, all identified, the last being almost a "record" event. — *W. H. Tuck, Tostock House, Bury St. Edmunds.*

THE Governors of the People's Palace, on Tuesday, 20th ult., appointed Mr. Robert Holt to the recently-founded professorship of engineering at the People's Palace. Mr. Holt held an assistant lectureship to the engineering department at University College, Liverpool, since 1889, and has been connected with the Walker laboratories since their foundation. He twice obtained a Whitworth scholarship, and afterwards held a National scholarship, and was awarded a Science Research scholarship of the Commissioners of 1851 Exhibition. Mr. Holt, besides undertaking other original work, assisted Professor H. S. Hele-Shaw in the preparation of the Report for the British Association on the "Development of Graphic Methods in Mechanical Science."

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—All notes or other communications should reach us before the 8th of the month in order to *insure* their insertion in the following number of SCIENCE-GOSSIP.

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

W. J. PAUL.—Dr. Taylor's work on the Aquarium is published by Messrs. W. H. Allen & Co., 13, Waterloo Place, and not as stated last month.

EXCHANGES.

VIPERS.—Wanted, living or spirit specimens of the common viper, particularly its varieties, in exchange for other reptiles, micro. slides, and books. I shall be pleased to correspond with readers interested in the geographical distribution of this reptile and its varieties.—Mason, 203 Ebury Street, Eaton Square, London.

FOR sale at cost price, or exchange for geological slides, SCIENCE-GOSSIP, Nos. 57–205, inclusive (1878–81), 169 missing, and 213 extra.—Cook, Edina, Leicester.

SCIENCE-GOSSIP for 1887–89, and 1891, unbound. Wanted, offers or foreign stamps.—D. Thomson, 81 Kyverdale Road, Stoke Newington, London.

WANTED, British or foreign birds' eggs. Exchange.—W. Gyngell, 155 Prospect Road, Scarborough.

WANTED, curiosities from all parts, also good minerals of crystallisation, and coal ferns. Satisfactory exchanges in British marine shells, micro. material, etc.—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

WANTED, good microscope: will exchange harmonium or science books.—J. R. May, 6 Perry's Close, East India Road, Poplar, E.

WANTED, to exchange a brown rigid waterproof camera case, 9½ in. high, 8¼ in. wide, 14½ in. large, inside measure, never used, with sling and lock; a ¼-plate changing bag, also ½-plate sliding mahogany tripod stand, the top slightly damaged, for English and foreign stamps, post-cards, and envelopes.—George Waters, 21 Westbourne Park Road, Bayswater, London, W.

WANTED, *Lampropax piceus, Rhyparochromus dimidiatus, Nysius brunneus, Monanthia similis, Campylostira bradrycera, Orthostira concinna, Aradus atterimus, Teratocoris viridis, Phytocoris distinctus, P. marmoratus, P. dubius, P. crassipes, P. floralis, Litosoma obsoleta, L. ochrotrichus, L. prasina, L. chloroptera, L. Douglasi, Aëthorhinus bilineatus, Globiceps ater, G. dispar, Tinicephalus obsoletus, Psallus simillimus, P. Fieberi, Bothynotus pilosus, Pseudophleps inconspicuus, Acanthia pipistrelli, Salda fucicola, S. marginella, S. vestita, S. morio, S. conspicua, S. elegantula, Notonecta maculata, Corina Scotti, C. limitata, C. venusta, C. Boldi, C. socia, C. Wollastoni, C. sodalis, C. cognata, C. Douglasi, C. borealis, C. perplexa, C. variegata, Sigara Poweri.* Cash or exchange.—G. K. Gude, 5 Gresbach Road, Upper Holloway.

THE Curator of the Botanic Garden, Cambridge, would be glad to give something in exchange for some Botrydium, in condition to cultivate.

OFFERED, *Papilio podalirius, Thais polyxena, Gonepteryx, Cleopatra, Thestor ballus, Charaxis jasius,* and others from Hyères, South of France. Wanted in exchange, British or foreign shells.—B. Stracey, 45 Fountainhall Road, Edinburgh.

A FEW slides of "The Challenger Expedition Dredgings," 1950 fathoms, containing *Cosc. Africanus,* var. *Wallichiana, Cosc. lentiginosus, Actinocyclus Oliverianus,* etc.; also a few good polyzoa, named. Send lists to Rev. A. C. Smith, Crowboro, Sussex.

SCIENCE-GOSSIP, "Knowledge," "Nature," Chambers' "Encyclopædia," Kirby's "European Butterflies and Moths," Darwin's works, etc. No reasonable offer refused. List sent.—W., 106 Trinity Road, Birmingham.

WANTED, nicely-pressed seaweeds, ferns, and showy flowering plants; the smaller common species in quantities (no roots). Will give named insects in return. Also wanted, a piece of elm bored by bark beetle (*Scolytus destructor*).—S. L. Mosley, Beaumont Park Museum, Huddersfield.

OFFERS wanted for a fine ⅛-inch objective, by Collins; also a pair each of B and C eye-pieces, fitted with shades.—P., 8 Whitehall Park, Hornsey Rise, N.

DUPLICATES of podalirms, Cleopatra, edusa, daplidia, belia, euphenoides, cardamines, syllius, megara. Desiderata include all erebias, palæmon, actæon, pruni, *W. album*; high-set or unset preferred.—G. H. Bryan, Thornlea, Cambridge.

WANTED, entomological store-box or small cabinet, setting-boards, pins, or any apparatus. A large number of named flowering plants, ferns, mosses, &c., offered in exchange.—J. A. Wheldon, Chemist, H.M. Prison, Liverpool.

WANTED, *Hypnum Wilsoni, cordifolium, Polytrichum gracile, Atrichum crispum, Bartramia ithyphylla, Swartzia montana, Didymodon denudatus,* var. *alpinus, Dicranum fuscescens,* etc. Wanted, *Sphagnum papillosum, fimbriatum,* and *strictum*; *Webera acuminata, polymorpha, annotina,* and *Ludwigii*; *Neckera pennata, Brachythecium salebrosum, Hylocomium umbratum.*—J. A. Wheldon, Chemist, H.M. Prison, Liverpool.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—"The Microscope" (Microscopical Publishing Company).—"The Naturalist" (London: Lovell Reeve & Co.).—"The Canadian Entomologist" (London: London Printing and Lithographing Co.).—"Geological and Solar Climates," by Marsden Manson, C.E. (London: Dulau & Co.).—"The Odes and Carmen Seculare of Horace," translated into English verse by T. A. Walker, M.A. (London: Elliot Stock).—"On Some New Irish Earth-Worms," by Rev. Hilderic Friend, F.L.S. (Dublin: Ponsonby & Weldrick).—"Decipherment of Blurred Finger-Prints," by Francis Galton (London: Macmillan & Co.).—"On a New Species of Earth-Worm," by Rev. Hilderic Friend, F.L.S. (Dublin: Ponsonby & Weldrick).—"Natural Science" (London: Macmillan & Co.).—"Feuille des Jeunes Naturalistes" (Paris: Oberthur & Rennes).—"Modern Microscopy," by M. T. Cross and Martin J. Cole (London: Tindall & Cox).—"Studies of British Tree and Earth-Worms," by Rev. Hilderic Friend, F.L.S.—"American Microscopical Journal" (Washington: Smiley).—"Natural Food" (London: Fowler & Co.), etc., etc.

COMMUNICATIONS RECEIVED UP TO THE 10TH ULT. FROM: T. G. W.—W. H.—A. R. G.—J. A. W.—W. H. S.—P.—S. L. M.—J. T. K.—H. B.—G. A. H.—F. S. M.—J. W. M.—E. H. R.—etc., etc.

THE ROCKS OF THE NORTH-WEST OF IRELAND.

By CHAS. WARDINGLEY.

TO study the geology of the north-west of Ireland is practically to study on a somewhat extensive scale the entire subject of regional metamorphism. Only three very limited areas in the counties of Donegal and Londonderry have types of other than ancient altered rocks. In the extreme west, with Dunglow as a centre, granite is the prevailing material. On the south-east shore of Lough Foyle the carboniferous limestone becomes visible, while in the south-west of Donegal a section occurs about twenty-eight miles long, from Blue Stacks Hills to Lough Melvin—through Donegal and Ballinbra—in which the old red sandstone and carboniferous rocks are seen dipping to the south off the older mica slates which flank the 2200 feet of granite forming the Blue Stacks. With the exception of these three areas, the rocks of the country under consideration—the North-West Highlands of Ireland—may be referred to the Lower Silurian, or, to use the more modern term, Ordovician Period.

I think it was Dr. Hull who first drew attention to the extremely interesting and curious geological fact that if a straight line be drawn on a stratigraphical map from Galway Bay, on the west of Ireland, to the Firth of Tay, on the east of Scotland, it would divide the older palæozoic rocks of the British Isles into two sharply defined series. North and west of this line all the Silurian and Cambrian rocks have been altered and their organisms obliterated, while south and east of the same line the members of the same series are in a great measure unchanged and their fossils, graptolites, trilobites, and brachiopods, preserved.

Our district belongs to the first-named series, and accordingly any one who has hitherto only been acquainted with Salop or North Wales outcrops must be prepared for a great difference both in the mineralogical composition of the rocks and in their general appearance. In fact so different are they in every respect from typical Llandeilo and Caradoc beds that in themselves they give absolutely no clue to their identity, and we can only arrive at their geological horizon by comparing them with other recognised altered strata, and by observing the position they occupy relative to other rocks. It has been definitely ascertained that they lie unconformably upon Cambrian rocks, and that their general inclination is in a north-westerly direction. In an unaltered state the Ordovician system presents to us a series of shallow-water formed sandstones, and deeper-water formed flagstones and shales. In places where these are most fully developed they seem to merge gradually into, or alternate with, each other, the result, probably, of differences in local geographical conditions. In Co. Londonderry the common rock is mica slate, or schist, passing from that into clay slate, chlorite slate, gneiss, and quartzite. This slate is made up of minute particles of mica and quartz, arranged in parallel layers, and splitting quite easily along the lines of lamination. The result is that the mica is more observable than the grains of quartz, which are only evident on the cross fracture. In many places in Scotland where similar metamorphosed rocks are found, garnets are of frequent occurrence, but in the north-west of Ireland they seem to be somewhat rare, an examination of many exposures, and many scores of specimens from various localities having failed to yield the faintest signs of one.

But though mica slate is the common rock of the two counties, it is not persistent either in its texture or in its mineralogical structure. It very frequently passes into an argillaceous rock, having two distinct forms, one a strict clay slate, in which the minerals are quite unrecognisable, and the other a chlorite slate. Both kinds are prevalent. In the latter the mica has entirely disappeared. and has been replaced by chlorite, giving to the mass a yellowish-green hue, and a very greasy touch. A noticeable feature in both kinds of rocks is the absence of quartz veins—though this may be remarked of nearly all clayey deposits. Most probably the rock was laid down orlginally as a shale, which has since been indurated by heat and pressure, a cause which at the same time developed from the particles the chlorite which occurs so abundantly in the mass. The general dip of the strata is at an angle of not less than 20°, though it very frequently approaches 30°. Every precaution must be taken by the student that the cleavage planes be not mistaken for the bedding lines, an error easily fallen into where there are only small local outcrops, and where but few bedding lines are visible. Unfortunately no deep excavations or very extensive cuttings have in any place been made, the rock containing no mineral of economic value, and being in itself of only minor importance as a building-stone. For this purpose it is much too liable to decomposition by weathering, whilst it is generally quite useless as a roofing-slate on account of its softness. When used for building purposes it has, if exposed to the atmosphere, to be painted or whitewashed, hence the peculiarly clean, not to say picturesque, appearance of so many of the houses in this part of Ireland. Of course this is the case with many other dwellings in many other lands, and I have frequently heard much praise and credit bestowed upon the inhabitants on account of it. But in reality, and with all due respect, encomiums are no more due to them for these clean and neat appearances than they are to the mole for making his mound. Necessity demands a preservative for the soft materials forming their houses. Necessity is the mother of invention, and the invention in this instance has been paint and whitewash. How frequently we confound the results of necessity with the results of virtue !

Mica slate is more commonly used than clay slate or chlorite schist as a building material. It is much harder and more durable. Berthier, who made a special study of metamorphosed rocks, found the first-named to contain ten per cent. more silica, and two-and-a-half per cent. less water than the latter ; an analysis which fully accounts for the difference in the hardness of the respective materials. These mica slates, clay slates, and chlorite slates are well exposed in the neighbourhood of Londonderry and the south-west extremity of Lough Foyle, where there are many very accessible exposures.

Mica slate passing into gneiss occupies a much smaller area, and may best be examined in Co. Donegal to the west of Letterkenny. It probably represents the shallow-water sandstones to which allusion has previously been made. Here the gneiss shows itself on the crests of the hills, giving to them a more rugged aspect and a less fertile soil. This rock is composed of similar materials to those forming the granite of the Derryveach Mountains—quartz, felspar, and mica. It has a very massive appearance and contains the first-named mineral in grains the size of a small pea. These grains are also arranged in layers parallel to the bedding of the rock. The matrix is quartz, though occasionally very small crystals of felspar (orthoclase) are perceptible in it. The mica becomes visible only on the face of the layers. Quartz veins are numerous in this rock and appear to have been formed by the infiltration of water containing silica in solution. These cracks have been formed antecedent to the metamorphic process, while the infiltration and precipitation have quite probably been coincident with it. Hand specimens do not exhibit the foliation so commonly seen in gneiss, but the rock in the mass shows it very clearly.

At Buncrana on the east of Lough Swilly, and also extending from the west of the same Lough to Kilcrennan, a most interesting series of metamorphic limestones and quartzites occur. These are very extensive, the latter being of a light red colour, and the former varying from grey to green. The occasional bands of limestone and dolomite are very similar to those found in the schistose beds of Scotland, and have been considered by many eminent geologists to have been of contemporaneous origin. North-east of Buncrana there is a trap dyke of felspathic and augitic greenstone, which I am given to understand finds much employment for those individuals who are deprived of their liberty for their country's good.

Somewhere on or near to the eastern shore of Lough Swilly there is a considerable bed of diallage or gabbro rock—a crystallised aggregate of a variety of augite with the triclinic felspar-plagioclase. The first-named mineral appears in distinct dark-green crystals, which are very lustrous. As I could only find this rock in detached masses where the waters of the Lough had evidently thrown them up, I am unable to localise the bed. Perhaps some local geologist may be able to do this. I, however, came to the conclusion that it must be associated with the same volcanic outburst which produced the greenstone, and of which outburst it was probably a part.

Quartzite occurs at Mount Errigal (2460 feet), and in many other places. It occupies a belt (occasionally broken by granite) varying from twelve to fifteen miles broad, which runs roughly parallel to the north-west coast.

At the beginning of this communication I mentioned that no beds more recent than palæozoic were met with in this district. The glacial period has however left the usual evidences of its existence, and every valley and every hill bears witness to its effects. Round the margin of Lough Foyle there is an elevated bank or ridge made up of sand and pebbles. The latter include varieties of all the metamorphosed rocks in the locality—schists, slates, quartzites, etc., together with a very large percentage of rocks not found in the neighbourhood—granites, gneiss (different from local types) primitive greenstone, and occasionally carboniferous limestone. Very many of these have been ground down and show quite clearly the striæ produced during the process. In England and Scotland the centres of glacial depression have been in mountainous districts, and we have been accustomed to look north and east for the source of our ice-borne rocks. In Ireland the case is somewhat different. The accumulation of snow took place there in a great central reservoir situated on a plain about five hundred feet above sea-level. This snow-field sent off glaciers in three directions, north, south, and west, which tore off and carried away masses of the various rocks over which they passed previous to melting. Icebergs and ground ice may also to a lesser extent have operated with a similar result, and thus we find in all parts specimens of rocks which have been transported twenty, forty, even sixty miles from the spot in which they were originally deposited. One such glacier would appear to have had its termination near the site of Londonderry, running north-east and then north between the elevations on each side of the river Foyle.

CONCHOLOGICAL NOTES.

A FEW notes on the Land and Freshwater Mollusca of three of our southern maritime counties may be of interest to conchological readers.

Last July I spent three weeks at the little seaside village of Chideock, near Bridport, Dorset. The most interesting of my molluscan captures there was *Arion ater*, var. *bicolor*. This slug, which had previously been only recorded in England from Stroud, Gloucestershire, was fairly abundant; altogether about a dozen were taken, although the weather was very dry and consequently unfavourable for slug-hunting. The other slugs found are *Arion ater*, type and vars. *rufa* and *nigrescens*, *A. hortensis*, *Amalia gagates*, var. *plumbea*, *A. marginata*, *Limax maximus*, type and var. *fasciata*, *L. flavus*, *L. agrestis*, type and var. *sylvatica*, and *L. lævis*. Var. *plumbea* was the most abundant form of *Arion ater*, omitting from consideration var. *bicolor*, of which more specimens were found than of any other variety of this species. Of the *Limacidæ*, *L. maximus*, var. *fasciata*, and *L. agrestis* were the commonest. Of *Succinea*, only *S. putris* was to be found. The *Zonites* included *Z. cellarius*, *Z. alliarius*, *Z. nitidulus*, all abundant, and *Z. crystallinus*.

I paid special attention to the varieties of *Helix nemoralis* and *hortensis*, and for some time collected all the specimens I could find. I have 576 specimens recorded in my note-book, of which 453, or 78 per cent., are *H. hortensis*. The most common varieties of *hortensis* are *lutea* and *incarnata*. The following table gives the forms of var. *lutea*, with the number of specimens found :—

12345	227
123(45)	3
(12)345	4
(12)3(45)	2
(123)(45)	4
(12345)	1
$1_{2}045$	1
02345	2
10345	19
00300	7
00000	103
Total	373

Of these forms, 00300 is of course by far the rarest.

Var. *incarnata* appears thus :—

12345	26
123(45)	1
(123)(45)	1
(12345)	1
10345	1
00000	18
Total	48

The other varieties of *H. hortensis* are *lutea-roseo-labiata* 123(45); *arenicola* 12345, $(12)34_{5}$, $_{1}0345$, and $_{12}34_{5}$; *roseozonata* (12345); *baudonia* 12345, (12)3(45), (123)(45), and (12345); *pallida* and *olivacea* 00000.

Coming to *H. nemoralis*, the yellow and red varieties are again the most abundant. The forms of var. *libellula* are :—

12345	8
(12)345	1
(12)3(45)	3
10345	2
00300	12
00000	19
Total	45

Var. *rubella* is distributed as follows :—

12345	10
123(45)	3
(12345)	3
02345	1
00300	21
00000	4
Total	42

The other varieties of *H. nemoralis* are : *castanea* 00000 (thirty specimens), and 00_300 (one specimen) ; *petiveria* 12345, 12345, (12345), and (12^345) ; *studeria* 00000 ; and *olivacea* $_{12}34_5$. I should add that I am indebted to Mr. T. D. A. Cockerell for naming these varieties, and for much other information.

It is well known that thrushes in seasons of scarcity hunt for snails, and to extract the animal break the shell by beating it against a stone. Stones that have been used for this purpose, with the broken shells lying round them, are frequently noticed, but I had never before found these remains in such abundance as on the present occasion. A very large proportion of the 576 recorded specimens of *H. nemoralis* and *H. hortensis* consist of these fragments ; in fact, the birds had so thoroughly worked the district, that until towards the end of my visit, when a heavy fall of rain induced the snails to come forth from their inmost hiding-places, I did not find more than a dozen live shells of these species. The lanes were everywhere sprinkled with broken shells ; during an evening's stroll I counted 101 specimens, not including *H. aspersa*, which was also abundant. On another occasion I found 42 *H. aspersa*, *H. nemoralis*, and *H. hortensis* round one stone ; and, after the shower already alluded to, in a narrow lane not more than one hundred yards long, I picked up 128 specimens, and many more had been trodden under foot. (In order to avoid mistakes, or at least to err on the safe side, I counted the lipped mouths to find the number of these broken shells.)

The other *Helices* found at Chideock are *H. aspersa*, *H. arbustorum* (one specimen), *H. rufescens*, *H. concinna*, *H. hispida*, *H. virgata*, and vars. *minor* and *albicans ; H. caperata*, *H. rotundata*, and *H. pulchella*. *H. virgata* was very abundant on the hills ; *H. caperata* was rather scarce, and I could not find *H. ericetorum* at all. The remaining land-shells are *Pupa marginata*, *P. umbilicata*, *Balea perversa*, *Clausilia rugosa*, and *Cochlicopa lubrica*. Owing to the scarcity of ponds, etc., I could only find five species of freshwater shells ; they are *Sphærium corneum*, *Sph. lacustre*, *Limnæa peregra*, vars. *intermedia* and *ovata*, *L. truncatula*, var. *minor*, and *Ancylus fluviatilis*.

During a short visit to Portland I found *Arion ater* (type), *Succinea putris*, *Zonites cellarius*, *Z. purus*, *Helix aspersa*, *H. virgata*, *H. hispida*, and var. *subrufa*, *H. rotundata*, and var. *pyramidalis*, *Pupa marginata*, *Limnæa truncatula*, vars. *minor* and *microstoma*, and *Ancylus fluviatilis*. If I had had more time, *Helix lapicida*, *Cyclostoma elegans*, and *Bulimus acutus* would doubtless have been added to the list, as in former years I have found all three abundant.

I am indebted to a friend for a pleasant excursion to the famous Pinney Landslip, near Axmouth, which proved to be an exceedingly productive hunting-ground. During an hour's search I found *Zonites cellarius*, *Z. alliarius*, *Z. nitidulus*, *Z. crystallinus*, *Z. purus*, *Helix aspersa*, *H. nemoralis*, var. *libellula* 12345, (12)3(45), (12345), $_{12}345$, 00345, 00300, and 00000 ; var. *castanea* 00000 ; *H. hortensis*, var. *lutea* 12345, $0_{23}00$, 00000 ; var. *arenicola* 12345. (*H. nemoralis* and *H. hortensis* do not appear to bear the same proportion to each other here as at Chideock, for out of the twenty-nine specimens I picked up only five are *hortensis*.) *H. rufescens*, *H. hispida*, *H. concinna*, *H. virgata*, *H. caperata*, *H. rotundata*, var. *Turtoni*, *H. lapicida*, *H. pulchella*, *Bulimus obscurus*, *Pupa secale*, *Clausilia biplicata*, *Cyclostoma elegans*.

From Chideock I went to New Quay, on the north coast of Cornwall. Here, strange to say, the first slug I saw was *Arion ater*, var. *bicolor*, and I afterwards found it very abundant on the grassy slopes of the cliffs overlooking the "Fistrell Beach." The New Quay specimens were hardly so fine looking as the ones from Dorset ; the integument at the sides was more prominently wrinkled, and a trace of dark colour was visible at the base of the furrows. The primrose of the sides was very faint in the specimens from both localities, and the colour of the back was more a dark grey than brown. One, however, from Porth, two miles from New Quay, was a rich chocolate brown on the back. Another rare slug obtained here was *Limax maximus*, var. *Ferussaci*, of which I only found one specimen. The other mollusca obtained at New Quay or in the neighbourhood are *Arion ater*, type and vars. *rufa* and *nigrescens ; A. hortensis*, and var. *rufescens ; Amalia marginata*, var. *nigrescens ; A. gagates*, var. *plumbea ; Limax agrestis*, with var. *sylvatica ; Vitrina pellucida*, *Zonites cellarius*, *Z. alliarius*, *Z. nitidulus*, *Helix aspersa*, and var. *minor ; H. nemoralis*, var. *libellula* 12345, 1_2345, 123(45), (12)3(45), (123(45), 02345, 023(45), 00300, and 00000 ; var. *baudonia* 12345 and 123(45) ; var. *rubella* 12345, (12345), and 00300 ; *H. hortensis*, var. *lutea* 00000. (*H. nemoralis* appears to be much more abundant than *H. hortensis*. Out of fifty-three shells collected from the railway embankment, only two belong to the latter species ; var. *libellula* 00300 is the most common form). *H. rufescens*, *H. virgata*, with vars. *major* and *albicans ; H. caperata*, with var. *major ; H. ericetorum*, with var. *alba ; H. rotundata*, *H. sericea*, *H. pulchella*, *Clausilia rugosa*, *Cochlicopa lubrica*, *Bulimus acutus*, with vars. *alba* and *bizoria ; Pupa umbilicata*, *Limnæa peregra*, var. *ovata ; L. truncatulata*, *Planorbis spirorbis*, and *Ancylus fluviatilis*.

Ealing, W. ANTHONY BELT.

A THEORY IN POPULAR LANGUAGE.*

"I AM Isis, no man hath opened my veil:" such words suit well to open such an argument as this, and yet she is not veiled so darkly as she once was, as many may think. We can see through it, but we have not raised it hardly. However, this clears a few of our doubts away regarding the world and ourselves, and tells us to hope for the day to come when we shall see "face to face" and not as in a glass "darkly."

We live in a world of prejudice. I do not say narrow-mindedness, but there are persons of the present day whose minds are capable of resisting prejudice and who would endeavour to make others do so also; however, with these few brief introductory words, let me plunge into the heart of my subject and attempt to unravel some of the mysterious meshes of the veil.

The world has not always been as it is, nor has anything else either, and yet it is true "there is nothing new under the sun" in more ways than one, which I leave to my readers to observe. We are all aware of the transformation of energy, that it cannot be destroyed, but only manifested in various forms, and of the wonderful power of the various forms of energy, light, heat, electricity, etc.: this being so, and matter also being indestructible, we cannot say that the world was made from nothing, for there must always have been something, and it is quite conceivable that energy has been the main cause of the world as it now is, and that it will be the dissolutor of the world when it comes into some other manifestation of itself with matter. Hence there is no necessity to imagine beginning or end of the world, but only manifestations of its constituents.

Again can we reasonably speak of a good, all-powerful God, who creates what is harmful, what certainly appears not for the best, and yet it is done? Notice, as one or two simple but evident instances which are before us just now: the Siamese twins, the Orissa sisters, in the human race; the numerous monstrosities of a harmful kind in the lower animal and vegetable kingdoms. Can anyone see the use of the above, and if not, how can he say that God is good, and that He creates for the best, and does all things well? If we impute good to Him, we must also impute these cases as good. Secondly: a child is sick, or becomes sick and dies from disease, and we say it is the "providence or will of God," and perhaps this child was born of unhealthy parents, or lived in foulsome places, it was not strong enough to withstand the attacks of disease, and yet it is unfair to say God did it, it seems to me; still we must put such a child down to His direct creation or not at all. On the other hand it appears to me that the theory "survival of fittest" is a more likely case, and it can be seen plainly in the following, in which I see no intervention of God required at all.

Many people put down the fall of Babylon and Rome to the wrath of God; but it was not that, it was the result of luxury in excess, licentiousness, indulgence of all kinds, debasing and wasting their strength, till at length those hardier races (in the case of Rome) from Germany, owing to their better physical powers, were able to pour in and destroy them, the stronger thus taking the place of the weaker, and add to the above debaucheries of Rome, an outcome which could hardly have been helped, viz., the continual inherited defects in children during the latter times of the empire (which I believe must have been the case) who may have survived for a time; nevertheless we can see what a state of downward tendency they were in, and consequently what it led to. The same is seen in the North American Indians of the present day. If we impute to the good God these things, we have to say that He made at that time each of His creations less strong, (other causes as well, I will admit, of course might make them even more so), and this would also in time lead to their destruction—a most unreasonable and unfair argument against a good and perfect God, but not in the theory I spoke of above.

Here let us look at the individual parts of our own body. The poet Pope says in his "Essay on Man" that we could not make ourselves with more skill than we are made, and no doubt he infers from this, God alone could make us as we are. But looking at the eye, it is imperfect, so Helmholtz has said; the imperfections of the image on the retina are nothing compared with the incongruities in the domain of the sensations: such is the tenor of his teaching. Comparative anatomists say that there are valves in the body useless to us in our present state, and that we are only partially adapted in the structure of our limbs for walking on the ground on only two legs. Does the foresight of a good and perfect God appear at all here?—giving us machinery that is useless, and maybe harmful, and organs where needed specially, imperfect. Yet Pope's words are true, but the blind forces of nature make us what we are, through evolution and other minor changes subservient to that.

We see daily new creations being effected, being brought to maturity and how they die; in cells we may notice creation with microscope before our very eyes; as to how they die I need not speak of here, constant action produces constant reaction. As for death being the result of man's first sin, we know by geology that plants and animals of the lower order existed long before man appeared on the scene, and their fossilised remains prove death must have also come by various ways to both kingdoms.

But whence came the knowledge of self-consciousness? This is one great difficulty in such a theory, but may we not attribute it to a manifestation of

* Although we print this characteristic article, we must not be supposed to endorse its views.—ED. SCIENCE-GOSSIP.

energy, the natural though not understood result of a combination of other energies which issued forth spontaneously in this new form in due time. Of course, such is only a conjecture, but we must rest a good deal on positive probabilities rather than negative, if we, as we can hardly fail to, rest on positive facts rather than negative in doubts of this kind. That reason grows by degrees, I think, is the case, and that there is a reasoning power manifested in the lower animals, which gradually rises in tone till it reaches a distinctive culminating point in language (articulate).

A certain writer, whose "Elements of Psychology" I have read, says in it, that an educated dog acts only for what it receives, and also only for preservation's sake. I cannot wholly agree with him, as he puts all his actions down to instinct, because I believe that a dog has a fair amount of reason as well as instinct. Again, I believe ants have some reason, although Sir John Lubbock, in his book on them, would say the opposite; owing to their small size, however, and the few sounds, comparatively speaking, they make, we cannot judge well where their instinct ends or reason begins; so I would not say where in the animal scale reason first becomes nascent; but I venture to say what some put down to instinct alone in some of the higher animals, viz., the preservation of its kind, to be only partly that, aided by reason, and allow too, that animals direct both reason and instinct combined, specially towards the above; I think also there is very much of the same sort of reason, though no doubt owing to the higher standard of reason man has attained, it is not directed mainly to the above idea in the human race. Pierre Huber has partly the same opinion as this, I find when looking up, and this strengthens my belief in what I say still more.

What revolutionising results Professor Garner's experiments with apes may lead to in the theories on this subject, I do not pretend to know, but they may be the means of enabling us to believe more in the reasoning of lower animals. The following words, which they have said, indicate a primitive language; many similar meanings a word may have, showing that paucity of words is found in a primitive language. "Tenakor paketa," "Good morning, stranger;" "Achru," meaning fire, sun, warmth; "Kukena," water, rain, cold; "Goshku," food, act of eating. The three latter words are spelt phonetically.

But a religious instinct is peculiar to man. When we look round us, we are compelled to ask, how and whence came at the beginning this important factor into the human race? How came the idea of a God? God means creator, and it is only in this sense that the beginning of the idea of God may have come—the other attributes of the name came afterwards—when reason culminated to a certain point, naturally man thought it must have been almost contemporary with articulate language. Whence have I come? Who made me? And not having reached a high enough standard of reasoning, without a knowledge of the world almost in his rough state of wildness, he wa forced to assign to some Unknown his creation, and that unknown he thought of only as his creator—then gradually followed in close pursuit the other attributes belonging to the name, at first for some time only, of fear, terror, and not till he had risen to a much higher scale, in love. Now energy and matter are seen as that god by many. Physically speaking, the thought of God does not necessarily imply the existence of one in reality. Thus I have shown the evolution of the religious instinct, and have summed is up in a few words, and now let me enlarge on it a little. Turning to the lowest savages, we know they believe in a god, and this is just a little above the lowest scale of religious instinct; we at present on the earth have passed the lowest, never to return to it, but some are more advanced than others. The god of the savages is one of fear, and one they have no love for; and since they know there is death, they impute it to him as one of his fearful acts, not knowing why, scientifically, death comes. Then God is cruel in their eyes. Fear makes them worship the being, but in reality morality is the basis of their religion, and that is not very great; but morality is the basis of all religious instincts (excluding God), and this morality rises not at once perfect, but only by degrees, as reason advances, till it reaches the stage we of civilised countries are at.

All nations in their primitive condition have had like ideas about God and religion. The Druids seem, in very early ages, to have believed him "cruel, rewarding those who managed to follow him only with material comforts," and the Romans' early god or gods are hard and severe; the aboriginal tribes of Hindoostan had to appease their god Bura Pennu with blood, but it is now submerged into the worship of the god Buddha—a most ennobling deity. Many more instances of a like kind could be given, and the time will come when, probably, civilization will cause all these gods to be put away, and prove to those nations that the world was not made by them or by any other god. No, it is inherited prejudice that blinds; and yet this kind of religion is losing ground, and a more modified form of religion, and a more harmonising one is taking its place. We must base our religion on self-control—mental god—and whatever we do or do not do, must be guided by it. We must live up to our ideal Ego, curbing those errors which we are likely to fall into by it, and so handing down to posterity a higher standard of morality for religion; for if we do not do so, we must inevitably be weakened and debased, ultimately falling victims to entire destruction, and a better race of mortals will take our place and reign supreme till another still fitter takes theirs. But for living well a short time is long enough to do good to those around us, to elevate, and then to leave the world bravely, knowing we have done our best for the present race of our fellow-men and also for our posterity; then will the care for death be minimised, and although we see for certain no future before us, still we are always allowed to hope, and to hope that whatever our future state may be, if there is a higher one for us, we are safely bound for it, having conscientiously lived not for ourselves, but to raise the standard of life around us, and consequently our own as well.

JOHN H. BARBOUR.

A PLEASANT DAY AT PORTLAND.

PORTLAND is a good place for botanizing, as many plants, common and uncommon, may be found there. For the geologist it is perfection, and the entomologist will also find many specimens of Lepidoptera. The island at the highest point is said to be 490 feet above sea-level; it is surrounded by high rocks, and slopes away gradually towards the south.

On our arrival, we pass through Chesiltown, leaving the far-famed beach to the right. We take a side-path to get to the cliffs as soon as possible, and have a tremendous hill to climb, but this difficulty is quickly over, and the view amply repays us for the trouble. Fossils abound here. We come across fine pieces of fossil trees here and there. Upon reaching the hill top, we follow the coast overlooking the West Bay. Stone abounds everywhere, quarries with piles of huge blocks, waiting to be carted away, carts with teams of ten horses, for taking it over the tremendous hills, men busy quarrying, and many of them seem to have a knowledge that fossils are valuable. We find the common carline thistle, *Carlina vulgaris*, said to be a good weather-glass, and looking pretty with its glossy colouring in the sunshine. A few bee-orchis bulbs, *Ophrys apifera*, are just throwing up their spikes of bloom. The sea from this high ground looks perfect, with the Chesil beach stretching away such a distance; then, still further, the cliffs of Bridport and Lyme Regis; the little fishing-boats below us look the veriest cockle-shells. We in good time arrive at the lighthouse, then onwards to the Bill of Portland. The sea is magnificent at this point. In the distance a large vessel, beating up against the wind for Portland Roads, is a charming sight; presently a steam-tug bustles out from the port to guide her to her destination.

After our rest, we found the most flowery part of the island. Beds of pretty thrift, *Armeria maritima*, cheer the eye, in various shades, darkest pink to nearly white; then again, clumps of strange-smelling samphire, used as a pickle. A pretty blue flower, wild sage, *Salvia verbenaca*, grows in profusion, and we find a few plants of hound's-tongue, *Cynoglossum*. Then a fine plant of common borage, *Borago officinalis*, which later will be found in great quantity. Sea beet, *Beta maritima*, seems to abound here also, as well as the yellow rattle. Over the cliffs beneath, we have a fine view of some very large caves, and beautiful patches of various-coloured sea-weed, looking very lovely in the clear water; some long floating pieces are not unlike snakes. One curious thing in connection with one particular cave, is a large hole in the ground, some distance from the cliff; upon stooping down, the sea can be seen dashing in, with curious effect. Butterflies are scarce yet, to-day we only see the common blue Alexis, the meadow-brown *Janira*, and one or two other early varieties, but the air is still cold, and they can only be seen in little sheltered nooks. A lovely sight is a field of trifolium, with its deep crimson blossoms, and another of common saintfoin, *Onobrychis sativa* with its bright pink flower. In time we come to Pennsylvania Castle, encircled by trees, a very charming residence, at least in the summer; but we have to leave this, and the more interesting ruins of Bow and Arrow Castle, said to be erected by William the Second; neither can we now go to the old church dedicated to St. Andrew, nearly all traces of which have, however, disappeared. Only a small portion of the wall remains, and a few tombstones, to mark the spot; we leave these old historical ruins, and pass through the village of Wakeham, now again taking the cliff path. We get now a delightful view of the castle, surrounded by beautiful trees, and looking so picturesque. This part is not interesting for gathering specimens of flowers, and we hasten onwards, soon to arrive at the garden of the Governor of the convict prison, well laid out and beautifully kept. The prison looks immense, and the walls are of great height, presently we come to a little group of convicts pulling a cart, harnessed not unlike horses, which gives one a rather uncomfortable feeling; one or two faces are rather repulsive-looking, but the hideous dress helps to make them look worse; one of the number has a suit of blue, which tells of a nearly expired sentence, and good behaviour. The church dedicated to St. Peter is a very interesting building, erected by convict labour. The font we were told, was wrought by men utterly unused to that sort of work in their former life, and very nicely worked it is. The pulpit also should be added, and the exquisite chancel pavement must not be overlooked. Passing through the various villages of Portland, one cannot fail to notice the cottage windows, well-filled with flowers, especially in the neighbourhood of the prison, and near the quarries, one or two especially beautiful; the most perfect show of pelargoniums in a small space ever seen by the writer, and in another ferns in perfection. Where flowers are loved and well tended, there must be something good in the owners; it is a task that well repays one for all trouble.

The day had so far ended, as connected with Portland; a most charming walk it has been, and one not so soon to be forgotten, one of the few we could wish to enjoy again; but alas! this is not to be, everything pleasant seems to fly from us with speed, but the remembrance of such times is sweet.

A. MARSH.

NOTE ON THE DISCOVERY OF SOME RIVER-DRIFT IMPLEMENTS AT WEST WICKHAM, KENT.

By GEORGE CLINCH.

[*Continued from p.* 136.]

I HAVE already briefly pointed out the different classes of river-drift implements which I have found at Church Field. It now remains for me to describe the typical forms which are given in illustration of this paper.

[No. 17*] (Fig. 82) is a representation of one of the almond-shaped weapons found here. It is coloured yellow, and has not been much damaged since it was originally deposited in the drift clay, inasmuch as it has sustained only one small recent accidental chip. As is so usual with such weapons, some remains of

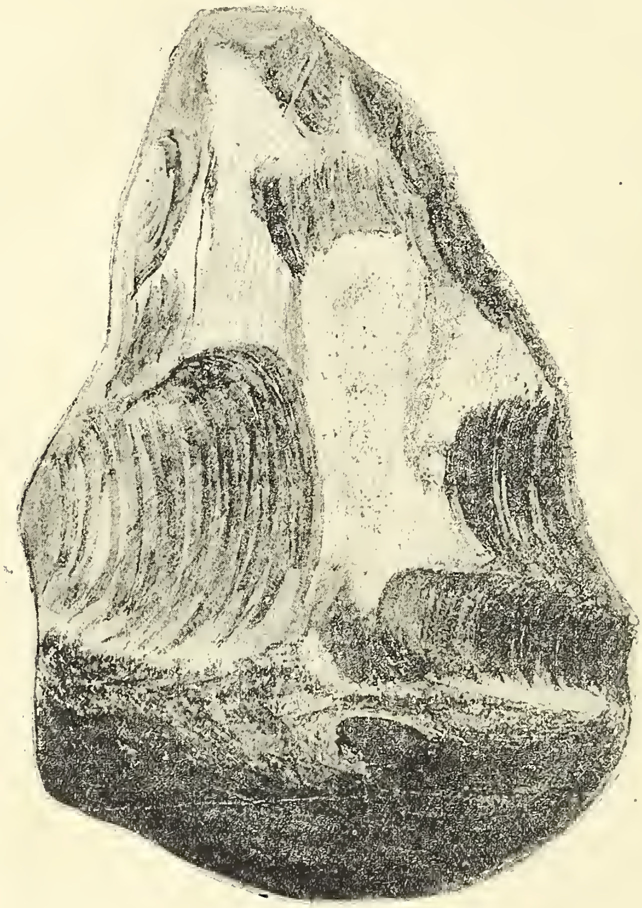

Fig. 82.

the original outside crust of the flint are still remaining upon the lower part of the flint. This end has some appearance of having been used as a hammer.

[No. 83] (Fig. 83) may have been used as a scraper or possibly (when perfect) as a weapon. The lowest part is broken off, but the fracture of the accidental break is as ancient as those upon other parts of the flint. Hence it is probable that the flint was broken while in use, and this probably led its former possessor to discard it. The colour of this flint is a bright yellow, and the surface presents some of those minute shining spots which have been produced probably by contact with other stones during an immense period of time. These lustrous spots are considered by Dr. John Evans to constitute "one of the tests of the

* I may mention that the numbers in brackets are those under which the flints are described in the catalogue of my own private collection, and are merely given here to prevent any mistake or confusion.

authenticity of a worked flint professing to belong to the River-drift Period."*

[No. 81] (Fig. 84) is a flake of simple form which does not call for any special remark in this place. It is given as a sample of the flakes which are most usually met with.

I am not aware that any palæolithic implements, apart from those at Church Field, have hitherto been found in the Ravensbourne valley, but perhaps if any reader of this paper knows of such a discovery, he will be kind enough to give, in these columns, any particulars he may think fit.

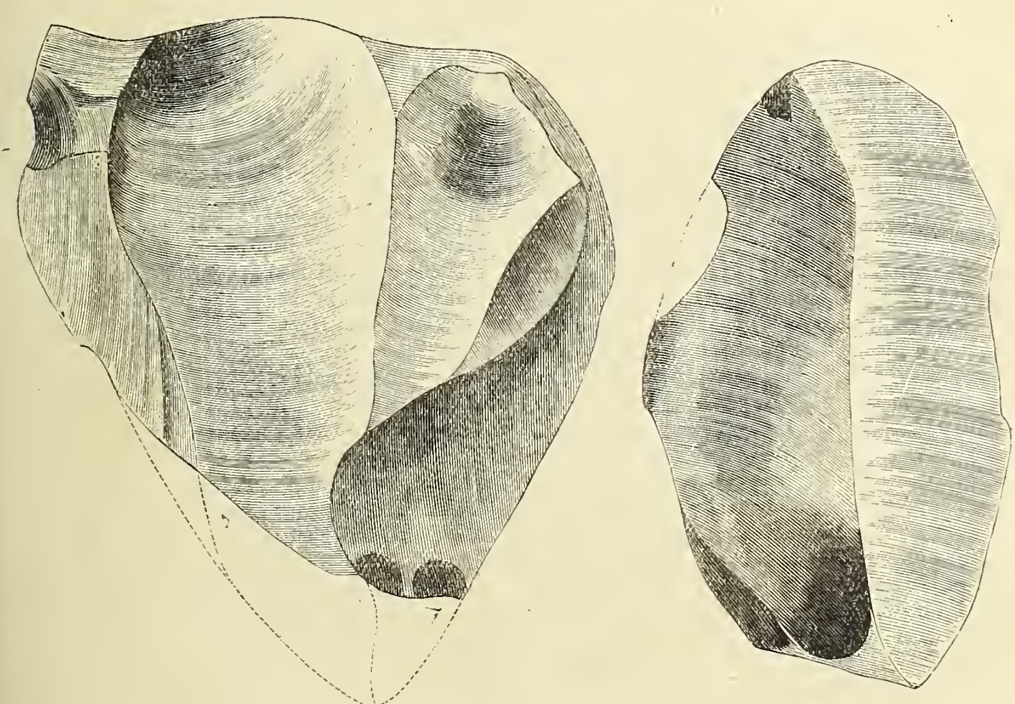

Fig. 83. Fig. 84.

EARLY STAGES OF TÆNIOCAMPA INCERTA.

By Claude Morley.

BEING unable to find any satisfactory or accurate description whatever of this very common caterpillar, it may be as well, at this time of the year when they are becoming full fed, to lay one, by which they may be easily recognised, before those who, taking the pupæ in plenty from oak, sallow, lime, and various kinds of poplar-trees in the winter, have yet no idea of the elegance of their larvæ.

I describe from living larvæ now before me. The ground colour is a pale pea-green, becoming whitish in the region of the dorsal line, which is broadly white. The whole of the larva is thickly sprinkled with minute white spots, which form a continuous and distinct sub-dorsal line on either side. The spiracular line is rather broad and of a beautiful primrose colour, penciled above, in the last skin, with a fine black broken line, and having the spiracles, which are white bordered with black, as a lower margin. On the eleventh segment the lateral line commences to drop, and, leaving the last spiracle (*i.e.* that on the twelfth segment) above it, terminates at the base of the last pair of prolegs. The margins of the anal orifice, at the apex of which the dorsal line ends, are also primrose. The head is pale blue-green and quite destitute of hair. The mandibles and extremities of legs and prolegs are dull yellow. Its extreme length when full fed is about fifteen lines.

In common, I believe, with the other members of its genus, it has considerable cannibalistic propensities. A nearly full grown larva, now in a chip box before me, is partaking of a hearty meal, apparently considering the soft pupæ of his brother who turned four days ago a very great delicacy. He does not eat it with a slow English dogged patience, as he would a leaf, but with a ravenous impatience, continually moving his feet, as if half afraid his meal will get up and want to fight him!

In my entomological diary for 1890 I find the

* *Vide* "Ancient Stone Implements," p. 510.

following short outline of the pupa. "Eight lines in length; typical noctua style; with no protuberances; two short spikes at apex; at the base of poplar and aspen (also lime, elm, willow and oak), from August to March."

There is a wonderful similarity between the pupæ of this genus, those of *T. incerta*, *T. gothica*, *T. stabilis* and *T. populeti* being identical one with the other, and it is impossible to pronounce with any certainty to which of the four any one pupa belongs.

The Museum, Ipswich.

THE HISTORY OF A FAMOUS SEA-ANEMONE.

AMONG the "common objects of the sea-shore" which especially engage the attention of the visitor during his summer holidays, few perhaps are more attractive than certain little jelly-like patches, or elevations, which he meets with on the rocks and stones at low-water, and which at first sight he may have difficulty in believing are the same as the beautiful flower-like objects that he sees fully expanded in the clear pools left among the rocks by the retiring tide. It is from their resemblance to a flower that they derive their popular name of "sea-anemones," a name, however, not very appropriate, as there are other flowers which they more closely resemble, for example the daisy, which has given the name to one of them. They were for a long time looked upon as being really flowers, but they are now known to be animals, a fact which becomes evident as we study their habits. They can change their position at pleasure, or alter their form, being at one time closely shut up, while at another they are expanded, with their tentacles arranged in a circle, and looking much like the stamens of a flower. They can detach themselves from the rock, or they can adhere to it by their fleshy base, when it will sometimes be found a difficult matter to remove them, and to be a very unpleasant operation for the fingers and nails. They will remain for hours motionless, with their tentacles fully expanded, until some animal swimming by may chance to touch them. No sooner is this done than the tentacles gradually close, the animal is held quite securely, being gradually drawn in through the mouth to the bag which constitutes its stomach. There are many different species of these zoophytes, or actiniæ, as they are also called, but it is to one particular animal that I am now about to refer. The one in question is called the "beadlet" (*Actinia mesembryanthemum*), from the circle of turquoise-like beads at the base of the tentacles, and is the most common of the British species. It varies very considerably in colour, passing from shades of brown up to vivid vermilion, and from this to orange, yellow, and green. The beads also sometimes look like pearls. These changes of colour may occur in the same individual, depending on the state of the skin, or other causes.

The particular "beadlet," whose history is now given, was taken by the late Sir John Graham Dalyell, on the shore of North Berwick, so far back as August, 1828, and died on the 4th of August, 1887. Sir John had early acquired a taste for natural history, which he probably cultivated more in consequence of an accident when an infant, which resulted in his being lamed for life, and therefore obliged to seek for amusement in mental, rather than in physical recreation: and to this the world is indebted for his valuable observations on marine animals, the result of which he has given us in his interesting works: "On the Powers of the Creator displayed in the Creation," and in "The Rare and Remarkable Animals of Scotland," both being beautifully illustrated.

At the time of the capture of this beadlet it was supposed, from a comparison with others which Sir John had bred, to be "at least seven years old," so that at the time of its death it had attained the venerable age of sixty-six years. For some years it had been known by the familiar name of "Granny." When first found it was a very fine one, though not of the largest size, and as it continued "in great vigour and of ample dimensions," its portrait was taken in October, 1828, and will be found coloured after nature on plate 45, in the second volume of "The Rare Animals of Scotland." It was then a reddish-brown, but when about thirty years old it became "rather of a dull greenish cast, the tubercle blue, and the ring at the base narrow and faint," but the colour has varied since. It was kept in a glass jar, five inches high and four inches wide, and its diet consisted of "half a live mussel once a month," and on the following day the sea-water was changed."

I am indebted for these and other particulars to the kindness of Mr. Lindsay, of the Royal Botanic Gardens, Edinburgh, who was the last of Granny's guardians. "Granny" lived with Sir J. G. Dalyell until his death in June, 1851, being at that date about thirty years old. After his death she was transferred to the care of Dr. Fleming, Professor of Natural Science, in the New College, Edinburgh, and whilst residing with him her earthly career was nearly closed. It was feared that she had been poisoned by some deleterious substance which had found access into the glass jar during the process of cleaning and painting the room. Dr. McBain was speedily summoned. Granny's condition appeared hopeless, but removal to another room, combined with a frequent supply of fresh pure salt-water, soon restored her to her usual health. She was highly prized by Dr. Fleming, and after his death in November, 1857, she was handed over by Mrs. Fleming to the care of Dr. McBain, with whom she lived twenty-two and a half years, until his death in March, 1879.

Shortly before his death the doctor handed her over to Mr. Sadler, Curator of the Royal Botanic Gardens, Edinburgh,—"with many earnest and pathetic injunctions relative to the care and treatment of the aged and historical zoophyte." Mr. Sadler died about two years after, and from that time his successor, Mr. R. Lindsay, carefully tended her up to the 4th of August, 1887, when she died in the same glass jar in which she had lived since 1828, and surrounded by fourteen of her grandchildren. Her death appears to have been caused by the destructive fungus, the *Sapro legnia*, which has of late years proved so fatal to many of the salmon tribe. During her life-time "Granny" made occasional appearances in public. She was exhibited by Dr. Fleming to his class in the New College, with the caution—"Oculis non manibus." In 1859 she attended the meeting of the British Association at Aberdeen, under the presidency of the late Prince Consort. In 1872 Dr. McBain exhibited her at a conversazione of a medical society, and again in 1874 at a meeting of the Edinburgh "Naturalists' Field Club," and for the fifth time at the meeting of the Royal Physical Society in April, 1878, when she formed the subject of an interesting paper by Dr. McBain, which will be found in vol. iv. of the Proceedings. Her "visitors-book," which was kept in the Curator's drawing-room at the Royal Botanic Gardens, contain, the signatures of upwards of one thousand visitors, including Lord High Commissioners, learned professors, travellers, and others. Allusion has been made to her progeny. She had numerous descendants, and well deserved the name bestowed upon her. During the twenty-three years she was in Sir J. G. Dalyell's possession she gave birth to 334 young; in 1857, when with Dr. Fleming, to 240 more "in the course of a single night," and Dr. McBain calculates that during the time she was under his guardianship she gave birth to upwards of 150 young ones, thus making a total of 724 young actiniæ. At present "one of her numerous progeny, born in 1872, and now much larger than ever she was, along with fourteen grandchildren, many of them now larger also, are in the Royal Botanic Gardens, Edinburgh, in very good condition."

Among her descendants, Sir J. G. Dalyell describes one which had "two mouths of unequal dimensions in the same disc: each mouth fed independently, and the system seemed to derive benefit from either. In three years this monster, which was a fine specimen, displayed tentacles in four rows, not in three, as in normal specimens: the tubercles were twenty-eight, and of a vivid purple. It had produced twenty-eight young, the first when fifteen months old, and it survived within a month of five years. Another form of monstrosity consisted of two bodies united. Four of this kind were produced, and survived ten years." These two forms of monstrosity are figured in Sir J. G. Dalyell's work.

Such is a slight sketch of this famous sea-anemone, interesting from the fact of its having lived so long in confinement in a small vessel, containing about a quart of water; and the lengthened period during which it has been under careful and scientific investigation. It is much to be desired that other inhabitants of the sea could be treated in the same manner as "Granny." Tracing their life-history through several generations would add greatly to our knowledge, and render valuable assistance in clearing up many of the undecided points in natural history.

EDW. SIMPSON.

24, *Grummant Road, Peckham, S.E.*

CURIOSITY SHOWS.

By J. B. BECKETT, Great Yarmouth.

"ONLY a pen-nay, come and see what yer never seed afore; it's suffen wonderful, an' its alive, all alive; nun o' your dead an' patched up things, but a real live curiosity."

Whenever I hear such a cry as this, or any other pertaining to curiosity shows, I make it my duty to invest the "humble brown," and see what the curiosity is. Amply repaid I always am, and my fellow-naturalists would do well to do the same, as very often most interesting natural history objects are brought under one's observation, which otherwise would be passed unnoticed.

The exhibition generally consists of some freak of nature, monstrosity, or out-of-the-way animal, and to make the affair look more complete, a few stuffed specimens, or other works of nature are sometimes added. Outside the show a little man with a big voice points to an apology for a picture, and announces in rather exaggerated terms, what's to be seen within, all for "wun pen-nay." In these shows scores of curious freaks and monstrosities of nature have been brought to my notice amongst them, for instance, being:—a sheep with six legs; a pig with two distinct heads, two pairs of eyes, two noses, two mouths, and two gullets; a goose with an extra leg; a double kitten; a two-headed calf; a three-eyed whiting; a two-legged dog; a cat with only one foreleg; a pig with two bodies and one head; a kitten with two faces; a double-headed lamb; a chicken with four legs; a mouse with two extra legs on its back; and others too numerous to enumerate here.

A collection of exotic snakes, or insects in spirits, go to make the exhibition more interesting, whilst a huge tooth, tusk, or other part of some extinct animal, excites admiration and wonder, the wonder being intensified by the manner in which the showman describes them, leading one to suppose that his "petrified bones" belonged to some giant animal twenty times bigger than the mammoth, his snakes were the most deadly poisonous species, or that his insects were the worst plague on earth, and a good job they didn't live in the British Isles.

It is a well-known fact that in all branches of the show business there are "catches" of some sort or another, so in the curiosity line a "get at" must now and again be expected. The most remarkable "catch" I ever came across was here, at Yarmouth, in 1883, and it caused considerable excitement at the time. Bills were extensively posted all over the town, announcing that on the following Saturday (market-day), the most curious animal ever seen would be exhibited in the market-place. It was described as resembling a pig, covered with scales similar to those of a crocodile, in fact, it was called "'The Marvellous Crocodile-Pig,' or as known by the natives, 'The Koi gafer,' from the wilds of South America." What more crowd-getting title could be chosen?

Saturday came, the show stood where it was announced to stand, and, from the time of opening until the time of closing, crowds literally besieged for admission. Outside hung a sheep's head, great bunches of vegetables, and other edibles represented to be what the animal lived on, whilst during the day, the quaintest of food and buckets of steaming hot water were continually carried in and out, presumably for its use. This performance of course "struck ile," every one thinking that it must be a marvellous creature to require so much attention. A few wiseacres were doubtful as to its genuineness, and wanted to know which was the biggest sheep's head, the one that hung at the entrance, or that of the showman (a now well-known Yarmouth naturalist). They, however, on being permitted to see the animal gratis, concurred with the general thinking, and pronounced it to be what it was described, a "Crocodile Pig."

Of the many hundreds who visited it that day, only one found it to be a "catch." Not a single untruth appeared in the description of the animal, yet only this one individual knew that the "Marvellous Crocodile Pig," or "Koi gafer," was a—Poyou armadillo. This shows what a lack of knowledge in even common natural history there is among the multitudes, and the sooner it is more practically taught in our schools, I think it will be the better.

Another "get up" recently exhibited at Yarmouth, was described as an elephant fish. Such a fish I knew there was not, so I expected a "take in," and true enough the "Elephant Fish" turned out to be a sun-fish. Capital had been made out of the pectoral fins, which were said to be the ears, not unlike elephant's ears, and together with the roughness of the skin, it took very well under its assumed name.

Other equally ingenious "catches" occasionally turn up, but I hope they will not deter my readers from visiting, at every opportunity, a curiosity show, for I am sure great pleasure will be derived thereby. although sometimes a misnomer is applied to the exhibit. This, however, must be overlooked, as it shows most people's ignorance, and the showman's ingenuity, who after all only does it to turn an honest penny.

AN EARLY MORNING RAMBLE IN THE ISLE OF WIGHT.

WHO is that banging at the door? We awake with a start, and look at our watch. It is five o'clock, and the morning looks dull and uninviting; but we remember that we are going for two or three hours' shooting before breakfast, and therefore, rousing ourselves, we make a hasty toilet. In about a quarter of an hour we stand outside the door in the cool morning air, and gaze on the scene

Fig. 85.

before us. In front lies the English Channel, looking calm, cool and misty; above is a cold grey sky, with a lighter shade in the east, foretelling the coming of the sun, and around us are the green fields and gardens, moist with the heavy dew. We fill our pocket with cartridges, and, having loaded our gun, climb over the gate which leads to the field of action. All around us is very quiet, and at first the place seems deserted ; but on getting close to the wall of a vegetable garden, on which we are going to make our first attack, we perceive we are not alone. There, close under a hedge, is a blackbird, hard at work getting his breakfast. Close to him are two or three linnets picking the seed off some grass, and on a row of peas hard by a wren is busily hopping from twig to twig in search of prey. A pair of bullfinches are enjoying themselves on a heap of dead wood. within gunshot ; and as we want one for a specimen, we take aim and fire. Bang! down drops the female, and we hastily reload and climb the garden wall to get our victim. The wall, however, is built of a pile of loose stones, and we almost push part of it down in our attempt to get over. On arriving safely at the other side, we pick up our bullfinch, and having smoothed her feathers and plugged any shot-holes to prevent the blood from damaging the plumage, we hide the body in a crack in the wall so that it may cool unruffled, and prepare for another victim. It is impossible, however, to get another shot in the garden at present, so we proceed down the field close to the right-hand hedge, keeping a sharp look-out for birds. Suddenly we hear a rustling at the bottom of the hedge, and we are immediately on the "qui-vive," but find that the cause of this disturbance is an innocent field-mouse, provendering for its young. A chirping nearly over our head attracts our attention, and on looking up, there, right before us, sitting on a twig that projects from the hedge, is a speckled bird, evidently enjoying the fresh morning. Such a chance is not to be lost, and we give him the benefit of a charge of shot, which tumbles him dead at our feet. We pick up the bird, which we discover to be a tree-pippit, and, after gazing admiringly at him, we treat him as we did the other, and deposit him in a dry place under the hedge, "to be called for."

The aspect of the scene has changed since we started: the sun is now shining brightly, and shedding light and warmth everywhere. The birds, wakened into life by its genial presence, are filling the air with their varied songs and calls. Overhead a flock of starlings is winging its way to distant feeding-grounds. Numerous water-wagtails are busily attending the cows, and innumerable robins and other birds are trilling forth their songs from the hedges. We traverse the slippery slopes to the extremity of our domain, and finding a hollow in the hedge, we station ourselves therein and await results. A rustle of wings, and there, within a few yards of us, is a yellow-ammer, gazing around him. We raise our gun, but the movement is perceived, and a flash like a departing meteor is all that can be seen of our intended victim. Fortune favours us, however ; for a little way off, in the very bush itself, is a tomtit. We bring him down with a shot, and treat him—"as if we loved him!" By this time a certain feeling of emptiness within warns us that it is getting near breakfast-time, so we wend our way back to the garden, collecting our specimens as we go, conveying them to their destination in our hat, which we remove for the purpose. This expedient we adopt in the hope of getting another shot before we leave off. Nor are we disappointed, for close to an old cowhouse is a fine water-wagtail. By creeping under shelter of the hedge we are able to get within range, and fire. To our great delight the wagtail topples over, making our first and only specimen of his kind. Knowing that the birds in the neighbourhood are now disturbed by this last report, and therefore not approachable, we gather up the spoil, reclimb the gate, and, entering the house, sit down to, and heartily enjoy, the breakfast which we at least think we have fairly earned.

D. W. Collings.

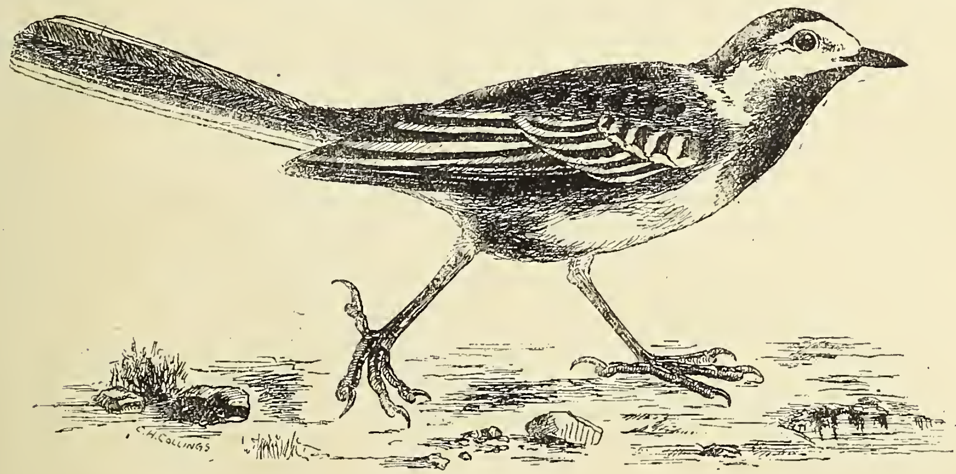

Fig. 86.

CONCHOLOGICAL CRACKNELS.

By Joseph W. Williams.

It would be well that the attention of those who wish for a uniform nomenclature should be drawn to the following; a nomenclature which may also be in accordance with the most recent and, at the same time, most approved taxonomie system. I crave no pardon in placing, by means of a short article, the following "Conchological Cracknels," as I call them, before your readers, since in this country, as far as land and fresh-water shells are concerned, no one seems to trouble about the "law of priority," but nearly everyone appears to deny its existence.

1. Ought not *Paludina viripara* (Linn.) to be *P. fasciata* (Auct.)?

2. Ought not *Planorbis nitidus* (Müll.) to be *P. fontanus* (Lightfoot)?

3. Ought not *Planorbis complanatus* (Linn.) to be *P. marginatus* (Drp.), or *P. umbilicatus* (Müll.), and, if so, preferably the latter?

4. Ought *Physa hypnorum* (Linn.) to be *Aplecta hypnorum*?

5. Ought not *Ancyus lacustris* (Linn.) to be *A. oblongus* (Lightfoot)?

6. Ought not our species of *Zonites* to be *Hyalina* or *Hyalinia*?

7. Ought not *Hyalina draparnaldi* (Beck) to be *H. lucida* (Drp.)?

8. Ought not *Pupa ringens* (Jeff.) to be *P. anglica* (Fér.)?

9. Ought not *Pupa marginata* (Drp.) to be *P. muscorum* (Linn.)?

10. But have we such a species as *Helix sericea* (Müll.) in our fauna? We have such a species as *Helix granulata* (Alder.)?

11. *Succinea virescens* (Morelet); what of this? Is it to be *S. vitrea* (Jeff.)?

12. Ought *Helix hispida*, var. *depilata* (Alder.) to be *H. depilata* (Pfr.)—a separate species?

13. Ought *Helix caperata*, var. *gigaxii* (Charp.) to be *H. gigaxii* (Charp.)—a separate species?

14. Ought *Clausilia rugosa*, var. *dubia* (Drp.) to be considered a distinct species?

15. Ought not *Achatina acicula* (Müll.) to be *Cæcilianella acicula*?

16. Ought *Limnæa Burnetti* (Alder.) to be a variety of *Limnæa peregra* (Müll.)? It is considered a distinct species in the Natural History Museum at South Kensington. Is this a case of species-splitting by the "New School"?

17. Ought not *Bulimus acutus* (Müll.) to be relegated to the genus *Helix* and to its sub-genus *Cochlicella*, and be evermore known as *Helix* (*Cochlicella*) *acuta*?

18. Is Hartmann's var. *rustica* of *Helix pomatia* distinct from the type? If so, how much?

19. Porro described a var. *brunnea* of *Helix pomatia*. What about Gredler's var. *piceata*?

20. Does Ulicny's var. *radiata* of *Helix pomatia* differ from var. *rustica* (Hartm.), or from the type?

21. Is *Helix ensarcosoma* (Servain) the same *Helix pomatia*, var. *solitaria* (Hazay)?

22. Moquin mentions a var. *parva* of *Helix pomatia*. What about Westerlund's var. *minor*?

22A. What is the difference between Kobelt's var. *erjaveci* of *Helix nemoralis* and Moquin's var. *interrupta*? Is there any difference?

23. Clessin describes a var. *conoida* of *Helix nemoralis*, and in Tryon's "Structural and Systematic Conchology" it is relegated to him. Ought it not to be relegated to Jenner?

24. There is a variety of *Helix nemoralis* known as var. *ponderosa* (Malm.). What about Ziegler's var. *lucifuga*?

25. Poiret described a var. *hybrida* of *Helix hortensis* with a pale reddish peristome and callus. Is there, then, any need for us to keep Taylor's var. *roseolabiata*?

26. Westerlund has described a var. *perforata* of *Helix hortensis*. What about Crowther's var. *umbilicata*?

27. Westerlund has described a var. *minor* of *Helix arbustorum*. What about var. *minima* (Pfr.)?

28. Jeffreys mentions a var. *major* of the same species. What about Clessin's var. *excelsa*?

29. Is Taylor's var. *cincta* of *Helix arbustorum* anything else than type?

30. Issel has described a var. *Anconæ* of *Helix cantiana*, with a peripheral white band. What about Cockerell's var. *albocincta*?

31. Colbeau, in 1866, described a white variety of *Helix cantiana*, as var. *alba*. What about Taylor's var. *Albida*?

32. Stabile described a var. *leucoloma* of *Helix cartusiana*. What about Brandon's var. *albolabiata*?

33. How much does Locard's var. *depressa* of *Helix rufescens* differ from Studer's var. *cœlata*?

34. Is there need for Lessona's var. *vulgaris* of *Helix hispida*. Type?

35. Bouchard described a var. *tessellata* of *Helix virgata*. What about Menke's var. *monilifera*? What about var. *Mœsta* (Parr)?

36. Gratel's var. *albicans*, Taylor's var. *alba*, and a var. *albida* described by Westerlund; all of *Helix virgata*. What about these?

37. There is a var. *alba* (Charp.) of *Helix ericetorum*. What about var. *albella* (Penn)?

38. How much does Cockerell's var. *subscalare* of *Helix ericetorum* differ from *M. disjunctum* as described by Turton?

39. Var. *albida* (Westrl.), var. *alba* (Moq.), var. *pallida* (Band.), and var. *albina* (Fér.), of *Helix rotundata*. What about these?

40. What about var. *alba* (Req.), and var. *albida* (Westrl.), of *Helix acuta*?

41. What about var. *exigua* (Menke), and var. *minor* (Fischer), of *Cochlicopa lubrica*?

42. How much does var. *sicula* (Rossm.) of *Hyalina cellaria* differ from the type?

Doubtless there are many other questions of nomenclature which require to be settled, but I hope the few I have mentioned will be well sifted by conchologists, and that my paper is but an earnest of a future uniform nomenclature between this and other countries. The question of priority is a vital one, and it is hoped that shell-workers in this country will accord to it more than a passing notice. No less vital—*i.e*, if we are going to have a varietal nomenclature of latinised terms—is a settlement of the priority of varietal names, and the bringing down of them to an exactness of meaning. The rendering of those things unto Cæsar which are Cæsar's is as fast and as true a duty to-day as it was nineteen hundred years ago, no less so in scientific nomenclature than in morals. As the present system exists in our country, the state of affairs is well shown in a slightly varied line from the fourth book of Ovid's Fasti, "Dum sibi quisque placet credula turba sumus," which being translated runs thus: "While each pleases himself we are a credulous crowd."

RECOGNITION OF ANTS.

IT has been shown that with ants, as well as bees, while the utmost harmony reigns among those of the same community, all others are enemies. I have already given ample proof that a stranger is not allowed among them. This of course implies that all the bees and ants have power to recognise each other. It is calculated that in a single beehive there will be as many as fifty thousand bees, and in the case of ants the number is greater. It is probable there may be as many as four hundred thousand, and in some cases even larger numbers. If, however, a stranger is put among the ants of another nest, she is immediately attacked. On this point I have satisfied myself, as will be seen in the following pages, that the statements of Huber and others are correct. If, for instance, I introduced a stranger into one of my nests, she was at once attacked; one ant would seize her by the antenna, another by the legs, and she was either killed or dragged out of the nest. Moreover, we have not only to deal with the fact that they know their friends, but they recognise them after a lengthened absence. Huber mentioned that some ants that he had kept in captivity, having accidentally escaped, met and recognised their former acquaintances, fell to mutual caresses by their antennæ, took them up by their mandables, and took them to their own nests. They came presently to seek the fugitives in a crowd under and above the artificial ant-hill, and even ventured to reach the bell-glass, where they effected a complete desertion by carrying away all the ants they found there. In a few days the rack was completely depopulated. These ants remained four months without any communication. Fovel regards the movements mentioned by Huber, as having indicated fear and surprise, rather than affection, though he is disposed to believe by his own observation that ants recognise each other after months' absence. The observation made by Huber was made casually, and he did not take any steps to test it by subsequent experiments. But I myself by experiments proved the accuracy. When we consider their immense numbers, this is actually surprising, but that they should recognise one another after a space of several months, as stated by Huber, is more so. Ants, after a separation of fifteen months, have recognised each other. This experiment was tried on the *Formic fusta*, or dark-coloured ant, but perhaps other species might act differently.

To further prove recognition I put an ant, at 9 a.m., August 13, on a spot where a number of the *Lassius lasius-flavus*, or yellow ant (belonging to one of my nests of domesticated ants), had been feeding some hours previously, though none were there, nor, indeed, out at all at the moment. The entrance to the nest was about eight inches off, but she made straight for it, and went into the nest. A second one wandered about for four or five minutes, and then went in. A third, on the contrary, took a wrong direction, at any rate for about three-quarters of an hour did not find the entrance.

Burmeister says that bees can communicate signs to each other after the fashion of men. Each bee has a different language, that is, each class, similar to "homo genus." Mr. McCook says that ants recognise each other by smell, and if you wash one in water he cannot be recognised by the companions or relations. Ants removed from a nest in the condition of pupæ, but tended by friends, if re-introduced into the parent nest are recognised and treated as friends. If ants are ill they are brought out of the nest, perhaps to prevent infection, and some think they are left to die. An ant nursing the young in a state of larvæ, recognises the same when arrived to the state of pupa, also afterwards. It seems by those experiments that the recognition of ants is not personal, that their harmony is not due to the fact that each ant is personally acquainted with each member of the community. At the same time, that they recognise their friends even when intoxicated, and that they know the young born in their own nest, even when they have been brought out in a chrysalis state by strangers, this seems to show that the recognition is not brought about by any sign or password, but somehow by smell, colour, form, by sound, as in language, by their physiognomy, by their actions in motion; also by their mental qualifications, the same as you would recognise an Englishman in a foreign country, or by the language an educated person uses at all times, etc.; or by any evidence of a genealogical character, or by any thoughts, words, or actions, that only a professor could know, the same as a sculptor, or a poet, or any mechanic, thus in a measure identifying that person by their knowledge of the language, either spoken, written, acted, or by motions, forms, by evidence of sympathy, and by that means a person cannot truly sympathise without a true knowledge of the individual, and as human kind a thousand years ago could not understand the variety of languages as now, so shall we accredit this species of entity with enlarging their powers of mental vitality as to even know their ancestry, of their former localities, their former colours, their warlike or peaceful former actions, "per homo genus, omnia."

The senses of vision in ants and bees. It is, I think, generally assumed not only that the world really exists as we see it, but that it appears to other animals pretty nearly the same as we see it. A little consideration, however, is sufficient to show that this is very far from being certain, or even probable. In the case of insects, moreover, the mode of vision is still an enigma. They have (at least many of them have) a large compound eye on each side, and ocelli generally three in number, situated on the summit of the head. The compound eyes consist of a number of facets, each situated at the summit of a tube, to the base of which runs a fibre of the optic nerve. The structure of the ocellus and that of the compound eye are different, and it does not seem possible that the ocellus should be derived from the compound eye, or *vice versâ*. On the contrary both seem to point back to a less-developed ancestry. Starting from such an origin, an increase of the separate elements, and an improvement of the lens would lead to the oculus, while an increase to the number of eyes would bring us to the compound eye. On the other hand there are reasons for believing the different kinds of eyes to be of distinct origin.

It seems clear that the picture produced by the ocelli must be altogether different from the picture given by the compound eye, and we may reasonably conclude that the two organs have distinct functions. It used formerly to be supposed that the compound eye was for distant vision, and the ocelli for near vision. Claparœdr, however, maintains the opposite theory, while Mr. Lowne regards the ocelli as incapable of producing anything worthy of the name of an image, and suspects that their function is the intensity in the direction of light, rather than vision. The ocelli, or simple eye, sees in the same way as ours do, that is to say the lens throws an image on the back of the eye, which we call the retina. In that case they would see everything really reversed as we do, though long experience has given us the right impression. The simple eye of insects thus resembles ours in this respect. As regards the mode of vision of the compound eyes there are two distinct theories. According to one, that is the Mosaic theory of Muller, each facet takes in only a small portion of the field, while, according to the other theory, each facet acts as a separate eye. This latter view has been maintained by many high authorities, but it is difficult to understand how so many images could be combined into one picture. Some insects have more than twenty thousand facets on each side of their head. No ants, indeed, have so many, but some there are that have not less than one thousand eye facets. The theory, moreover, presents some anatomical difficulties. Thus in certain cases there is no lens, and consequently there can be no image. In some it would seem that the image would be formed completely behind the eye, while in others, again, it would be in front of the receptive surface. Another difficulty is that any true projection of an image would in certain species be precluded by the presence of impenetrable pigment, which only leaves a minute central image passage for the light rays. Again it is urged that even the sharpest image would be useless, from the absence of a suitable receptive surface, since the structure of the receptive surface, belonging to each facet, seems to preclude it from receiving more than a single impression. The prevailing opinion of entomologists now is that each facet receives the impression of one pencil of rays, so that in fact the image formed in a compound eye is a kind of mosaic. On the other hand, this theory itself presents many difficulties. Those ants which have few facets must have an externally imperfect vision. Again, while the image produced in the retina of the ocellus must of course be reversed, as in human eyes, in the compound eye, on the contrary, the vision on this theory would be direct. That the same animal should see some things directly and others reversed, and yet obtain definite conceptions of the outer world would be very remarkable. But while it is difficult to perceive how ants see, yet they do see.

C. Pawson.

D'ton.

COLOURS OF FLOWERS.

I AM rather surprised to note that none of our botanical friends have had any comments to make upon the two articles in the June number, on the above subject, as it seems to me that there are several points in both, which ought not to be allowed to pass unchallenged. I regret that my own knowledge of botany is too limited to allow of my taking up the cudgels, yet I venture to make the following remarks, in the hope that some one better acquainted with botany may thereby be induced to enter the ring.

In the first place, the footnote on p. 134 says, "I cannot call to mind any instance in the works of either Darwin or Wallace, where colour in flowers is said to have been non-existent." Although the following passage does not say that colour was non-existent (for I suppose, wherever there is vegetation, there is colour, *i.e.* green), it *does* say that there was an absence of conspicuousness, which after all is the main point. On p. 161, "Origin of Species," Murray's Ed., 1886, Darwin says, "Flowers . . . have been rendered conspicuous in contrast with the green leaves, and in consequence, at the same time beautiful, *so that they may be easily observed by insects* . . . . Several plants habitually produce two kinds of flowers; one kind open, *and coloured so as to attract insects* . . . . Hence we may conclude, *that if insects had not been developed on the face of the earth, our plants would not have been decked with beautiful flowers*, but would have produced only such poor flowers as we see on our fir, oak, nut and ash trees, on grasses, spinnach, docks, and nettles, which are all fertilised through the agency of the wind."

I do not suppose for a moment that this important passage is unknown to the author of this article; on the contrary, I presume that he is acquainted with it, but begs to differ.

Supposing we reject Darwin's explanation, what theory can we suggest to supersede it? Our author thinks that flowers "were originally brightly coloured." Haeckel in his "Schöpfungs-Geschichte," 8th Ed., says, "With full certainty can we assert . . . . that no flower-plants (then) existed, and only during the primary period were they developed from fern-like cryptogams. . . . It is most probable, that the *immediate ancestors of the phanerogams were the scale ferns, or the Selaginaceæ.*" These plants are, I believe, of a uniform green colour, that is, have no conspicuous parts. The question consequently arises, "when and how did these lycopods in their development into phanerogams, become possessed of conspicuous parts, *i.e.*, coloured flowers?" If we are told they were caused by the products of physiological processes; we ask why should those processes produce no pigments in ferns, yet do so in the slightly more advanced form of the same plants?

It further seems to me, that too much stress is laid upon the ability of insects to appreciate *colour*, all that Darwin required, as I understand the above quoted passage, was, that they should be able to appreciate the difference between the conspicuous patch, and the sombre uniform surroundings. Clodd puts this very well on p. 89, "Story of Creation," whichever plants *made most show of colour* would sooner catch the eye of insects, *however dim their perception* of the difference in colours might be, and and would thus get fertilised before plants *which made less show*. Thus have insects been the main cause in the propagation of flowering plants, and plants in return developing the colour sense in insects." Or, as our author prefers it, "they produced the colours to attract themselves."

On p. 132, we have a return to the style of the pious writers on popular natural history of fifty years ago, and which one was almost hoping had been rooted out for ever, by the advance made by knowledge during this century. The colours of flowers have a higher function than the mere attraction of insects, namely that of ministering to the happiness of man, by gratifying that sense of beauty with which he has been endowed. Consequently before the evolution of man, the flowers were minus a function, there was waste; for all those thousands, aye hundreds of thousands, of years a world full of beauty was wasting its sweetness on the desert air, because he for whom they were created had not yet divested himself of his tail, nor educated his taste for the beautiful, above the colours of something less poetical than flowers. Whence, may I ask, the "sense of beauty," if not from the continued contemplation of existing beauty?

However, this is already too long, so I conclude with the words of Mr. Clodd, "Story of Creation," p. 83. "The primary function for which the organs of plants known as flowers exist, is not that which man has so long assumed. He once thought that the earth was the centre of the universe, until astronomy dispelled the illusion, and there yet lingers in him an old Adam of conceit, that everything on the earth has for its sole end and aim his advantage and service. Evolution will dispel that illusion."

A. ABSELL, Jun.

P.S.—Darwin has also a note on this subject ("Origin of Species," p. 160). "If beautiful objects had been created solely for man's gratification, it ought to be shown that there was less beauty on the face of the earth than since he came on the stage."

TWO REMARKABLE INSTRUMENTS.

OF making of instruments there is no end: the patent office is full of crotchets. But two instruments, recently invented by Mr. John Aitken, F.R.S., deserve more than a passing notice, not only on account of their ingenuity and attractiveness, but because of the beneficial sanitary results that are naturally expected from the use of them. By using the one the number of dust-particles in a cubic inch of air can be numbered; the other can detect deleterious matter in the air by means of colour. They are both required for the complete sanitary detective work. The one is the dust-counter and the other is the dust-detector.

The writer made experiments with the first in its crude and heavy form, and was perfectly astonished at the magical effects. But it is now made in a portable form, not larger than a cigar-case, for the pocket, and about eight ounces in weight. Both instruments depend upon this principle, that the dust-particles in the air seize the moisture from the air to form fog-particles visible to the eye, when the pressure is lowered so as to bring the temperature down to the dew-point. If jets of steam be introduced into two glass receivers, the one filled with common air and the other filled with filtered air (that is, air from which the dust-particles have been removed by being driven through cotton-wool), the first will become densely clouded, while the other remains quite clear. It is want of dust-particles that has prevented the formation of fog-particles in the second, whereas they are very abundant in the other. Dust, then, is necessary for the formation of fogs, mist, or rain.

The pocket instrument, when fitted up for use, may be thus generally described:—A carefully adjusted air-pump is so fitted up with a guide-collar, that the drawing down of this collar to certain marks enables the observer to introduce into the receiver measured quantities of the air to be examined. The glass-cylindrical receiver is a centimetre in height. Fitted into the bottom is the glass counting stage, and above it is a magnifying lens of about two-centimetre focus. The counting stage is divided into squares of one millimetre a side. This is a delicate process, and is effected by covering the thick glass with a thin film of beeswax, and drawing the lines with a fine needle-point, into which white hydrofluoric acid is introduced. A circular disc is then cu from this sheet of a suitable size for fixing into the bottom of the receiver. This micrometer stage is illuminated by the spot-mirror from below. This spot-mirror is simply an ordinary lighting microscopic mirror with a black circular space in the centre. This enables the fog-particles that fall on the stage to be illuminated by means of a slightly oblique light, while an image of the black spot covers the field of the lens. The result is that by the reflection of ordinary skylight from the surface of the mirrored part the drops are seen shining with brilliant opal hues on a nearly black field, and are counted with great ease. To make the fog-particles look like little round balls, with intense internal reflection, instead of adhering to the glass, and spreading themselves over it more or less, the glass should have a little refined beeswax put on it and rubbed off till its presence is scarcely detected. The inside of the receiver is kept moist.

When all is thus adjusted, the air in the receiver must be purified in this way:—A stroke of the pump is made; this causes condensation to take place on the dust-particles when some of them drop out of the air. The piston is again put to its top position and another stroke made, when more particles settle. After this process has been continued a few times all the particles of dust will have become nuclei, and be deposited on the bottom of the receiver. The air in the receiver will now be pure, no drops falling when expansion is made. The necessary quantity of impure air is then introduced into the receiver by sliding the guide-collar of the pump. A little extra arrangement is here needed which cannot be minutely described. There is a stirrer within for mixing the pure and impure air. On the pump being used, at one stroke the expansion makes the dust-particles seize the moisture in the air of the receiver, and fog-particles drop on the stage to be counted by looking through the magnifying glass. Suppose, for instance, that the guide-collar were drawn down to the mark $\frac{1}{50}$ on the scale, and on the average of ten tests, two drops were counted on each square millimetre. There would be in that proportion 200 drops on the square centimetre: and as the receiver is one centimetre in height, there would be 200 dust-particles in the centimetre. But this figure must in this case be multiplied by 50 to get the number of particles in the outer air, which in this case would be 10,000, that is, 156,250 dust-particles in the cubic inch. By this method the number can be counted in any specimen of air. The number can be counted in all places from 34 in the cubic inch on the top of Ben Nevis to 4,000,000 in the cubic inch at Edinburgh. At Rigi Kulm, near Lake Lucerne, they vary from 3360 to 37,600 in the same space. But they have been counted up to 489,000,000 in a cubic inch of the air arising from the flame of a Bunsen burner. Verily the dust is numbered!

The dust-detector consists of a test-tube of metal with glass ends about twenty inches long and one inch in diameter, and an air-pump with half the capacity of this tube. Next one end of the tube is a passage by which it communicates with the pump, and near the other end a stop-cock is fixed for admitting the air for examination. The tube is lined with moist blotting-paper. By a stroke of the air-pump the air is rarified, and the dust-particles seize the moisture in the air and from the inner surface forming fog-particles: looking down the tube, the observer is astonished to find a blue colour in the fog.

The dust-counter is employed to graduate the dust-detector. The eye is able to detect many different shades of blue, when it cannot assign names to the hues. With few dust-particles in the air to be tested, the colour seen in the fog of the detector is pale blue, and as the particles increase in number the blue increases in depth. On the outside of the dust-detector the different shades of blue are fixed in order, and opposite the hues are marked the number of dust-particles as found by the dust-counter when testing the air which produced the several hues. When the number of dust-particles in the cubic inch is $\frac{6}{10}$ of a million, the detector indicates "blue just visible;" when $1\frac{1}{4}$ millions, "very pale blue;" when 8 millions, "pale blue;" when 24 millions, "fine blue;" when 40 millions, "deep blue;" and when 64 millions, "very deep blue." When making a sanitary inspection, any increase in the depth of blue above the normal would indicate the amount of the increase of pollution of the air; and the figures on the scale corresponding to the depth of blue would indicate the number of dust-particles in a cubic inch of air. Of course this "detector" is new, but it is simple, and it will likely be so improved that sanitary officers can use it conveniently, and with a fair amount of accuracy. By an india-rubber tube, air can be taken into test-tube from any part of a room, or passage, or drain, and tested without any trouble. Mr. Aitken, in the course of his observations, was obliged to come to a conclusion quite opposed to one's expectations. A window is not an unalloyed boon as regards the purity of air in a room. In every case tested, he found that, when gas is burning, the air near the window is very impure. There is a polluted down-current of air from the ceiling. This is caused by the cold air on the window sinking and drawing down with it the polluted air near the ceiling. The impure air is brought down to the level of the face, and the lungs get the benefit of the pollution at every inhalation of air. This is of course most noticeable by the instrument when the windows have no blinds or shutters. It is, however, an unfortunate fact, discovered by the "detective." Though an open window supplies pure air, a shut unprotected window does much harm, by bringing down the polluted air which otherwise would remain near the ceiling.

Doubtless this matter is only in its infancy; much yet requires to be done to mature the inquiry. Flowers are cultivated as well as fruits; and important results are, it is to be hoped, yet in store by the improvements on these two remarkable instruments. Quite a new field is open for scientific inquiry in connection with sanitary reform. Who, till the other day, would ever have conceived that a preparation of the thyroid gland of a sheep could be instrumental in removing from a sufferer the awful close that usually attended the indescribable disease of myscœdema? Then sneer not at the initiative stage of these marvellous products of an inventive brain!

J. G. McPherson.

SUGARING FOR MOTHS IN JUNE.

When the nights of mid-June were too hot for sleep it was an agreeable change, after the burden and heat of the day, to sally forth into the Worcestershire woods in order to sugar for moths, and amid such pleasant surroundings, the self-allotted task became an all-absorbing occupation. An ideal spot came handy for sugaring operations, where a green drive intersected a thick wood, and open glades here and there on either side led into the inner fastnesses, through which the moths came forth at the fall of eventide. I have observed that the noctua and other night-flying kinds of moths habitually find an exit into the more open spaces, through such openings having, so to speak, their regular lines of flight, with which it is well to be familiar. Suitable trees flanked either side of the main drive, and experience soon revealed the best trunks to select for the purpose of sugaring. Thus, the buff arches (*Thyatira derasa*) and the peach blossom (*T. batis*) came especially to one or two trees through one particular opening of the woods, and the first-named proved restless, rarely settling well on the sugar. Both are "noisy" moths, beating their wings to pieces in a pill-box, therefore, it is my practice to kill them at once in the cyanide bottle, in order to secure good specimens. The peach blossom is really an exquisite moth with the delicate patches of pale coral hue on the outer wings. There is an imitative faculty connected with this moth, which possibly entomologists have recognised. At rest upon a tree, the ground colour of the wings is lost, while the pink spots are strangely suggestive of a fungoid growth upon the bark. Several times I nearly failed to detect the moth at all, which, by the way, has been plentiful with us in Worcestershire this year, at least three dozen coming under my own notice in June and July. A single specimen only of the figure-of-8 moth have I seen taken with sugar; though somewhat scarce, I believe it to be one of the representative Worcestershire species, perhaps more being taken in autumn pupa-digging than in the perfect stage of existence. Another fellow that has interested me deeply is the coronet moth (*Acronjeta ligustri*), which I have absolutely failed to detect from silver-grey lichens on the trees—the imitation is complete.

Certain moths swarmed in my particular wood, being so prolific as to become a real nuisance. Amongst these I may mention *Agrotis exclamationis*, *Triphæna pronuba*, *Aplecta nebulosa*, and *Miana* sp., the latter looking black upon the trees. The orange moth (*Angeronia prunaria*), apparently not common, was in perfect condition, and a solitary specimen of the blotched emerald (*Phorodesma bajularia*), attached to a blade of grass, had just come forth in an accommodating manner from the pupal sac. Many very beautiful specimens of the satin moth (*L. salicis*) I took from a weeping poplar, simply picking the snow-white creatures from the leaves, both males and females, together with the yellow-haired pupæ, and the handsome caterpillars. There were fully a hundred on the one tree, and one of the females at once proceeded to lay eggs in a match-box. It is a noteworthy fact that only on this one tree can I ever find the satin moth. The striking larvæ of the puss moth have the same habitat each year. The pupa cases, in the interstices of the bark; I can never discover until they are evacuated. The gold-tail I caught in the net shortly before dark, and also got somewhat severely urticated by the larva crawling on my neck. Amongst the noctua on the sugar the purple clay (*N. brunnea*) predominated. The small moth known as *fulvata* was exceeding plentiful this season, being readily beaten from the trees at the edge of the wood, whilst we waited for darkness to set in. The pretty scalloped shell was likewise to be taken. I might extend this slight record of the enumeration of some forty more or less common species of moths taken in three nights at intervals of a week.

In the daytime an esteemed companion succeeded in catching one of the clear-wings (*bombyliformis*) in Wyre Forest, together with larvæ of the five-spotted burnet moth, which have been successfully hatched out. Some oak eggars are still feeding. The humming-bird hawk has been generally common during the hot weather. On the oolitic hills I took a series of the wood tiger (*Chelonia plantaginis*) in nice condition, a moth unknown to us in the valley, I think. In the same place the burdock plume (*P. galactodactylus*) was feeding on the backs of the leaves in sub-pupal condition. Snails eat these leaves, but the circular holes left by the larvæ may be distinguished at a glance by a film of white fringing the edge of the eaten parts of the leaf, the snails leaving no such edging. The common mullein was also infested with larvæ of *C. verbasci.* There is a well-known haunt in these parts for *Procris statices*, which, however, has been less plentiful this year than last. One solitary specimen of *Colias edusa* I have seen by the Severn side, where a dozen were taken last year.

One day I travelled by train from Gloucester to Worcester carrying a cardboard box containing a female poplar hawk that had deposited a fine selection of eggs therein. The lid was pierced with holes. To my dismay I suddenly found a dozen little horned caterpillars vivaciously crawling on a lady's dress, she being in blissful ignorance of the fact. The wretched things had changed in the box, escaping through the holes in the lid. I "lay low," simply wrapping my precious box up in a newspaper. The escaped youngsters, finding the lady not exactly a poplar-tree or congenial food-plant, either died or disappeared. One death's-head larva I have seen this year, amongst potatoes. Quite by accident I found the peculiar eggs of the neuropterous lace-wing attached by long gossamer-like filaments to a leaf of mistletoe in the orchard. The elegant insect is common enough, but the eggs so disposed I had seen only in figured plates. The ephemera may-fly rose this year fully three weeks before the usual date. May 5th I saw several in the sub-imago state.

I caught a fly, that is one of the diptera, one day, but I am all at sea in the identification of this extensive order. Perhaps, in common with many others, I may find the opportunity of gaining knowledge from Mr. Theobald's new work on dipterous insects. The fly to which I allude in size resembled a house-fly, of slightly stouter build than ordinary ones. The abdomen was yellow. The peculiarity was a sharply-pointed process, or elongation like a snout, projecting from the front of the head. It formed a sharp defensive weapon, as I found when it punctured my hand.

There is little of value, I fear, in these entomological notes. It is my one great regret in the chequered course of life, to find that the closer the application to a study of nature the more profound one's ignorance appears. Still, there is a solid satisfaction derived from the mere effort to pierce the veil, and after all, a comparison of field-notes has some infinitesimal value.

C. Parkinson.

Worcester.

*** The entomologist occasionally finds himself in an undignified situation. For example, it is an injury to the feelings to be interrupted at midnight in the pursuit of peaceful avocations, as a poacher in someone's pheasant preserves. Equally embarrassing is it to be caught by an emissary of law and order up a lamp-post at 2 a.m., diligently bottling swallow-tail or tiger moths; there is, moreover, risk of being arrested as a harmless sort of lunatic under such circumstances. "Mad, my masters, mad," will be the popular verdict. And so we are to some extent; everyone, in degree, has a crack somewhere. Show me perfect sanity, and you will produce the perfect man! Still, there are relative grades in mental aberration, and even if I am caught up a lamp-post, I protest that I am as sane as most of my neighbours. It is the pursuit of knowledge that alone lands me in so equivocal a situation, and from the lofty eminence I gaze in tranquillity on the world below.

SCIENCE-GOSSIP.

Wincanton Field Club.—This provincial society, which has done some good work since its formation, held its fifth annual meeting in Wincanton on June 26th, the president, Mr. T. H. Baker, F.M.S., in the chair. After the annual report and balance sheet had been submitted, the officers of the club were elected for the ensuing year, and excursions for the season arranged. Mr. J. Phillis, of Shepton Mallet, then read an interesting paper on the discovery of Roman remains in that town, several cases of which he exhibited. A nice collection of British birds' nests and eggs was shown by Mr. E. A. Swanton, wasps' nests and local coleoptera by Mr. E. W. Swanton, and a fine collection of native Gramineæ and rare plants by Mr. W. Herridge. At the invitation of Mr. W. Galpin, the members took tea in the Market Hall, after which, under the guidance of Mr. G. Sweetman (hon. sec.), some ancient houses in the town were inspected, one of which, known as "The Dogs," attracted interest, William III. having slept in it on his way from Torbay to London.

THE 42nd Annual Meeting of the Birkbeck Building Society was held recently at the offices, 29 and 30, Southampton Buildings, Chancery Lane. The Report adopted states, that the receipts during the year which ended 31st March last, reached £12,169,030, making a total from the commencement of the society of £163,297,213. The deposits received were £9,857,817, and the subscriptions £215,871. The gross profits amounted to £213,867. The surplus funds now stand at £5,727,331, of which £1,670,210 is invested in consols and other securities guaranteed by the British Government. Upwards of two millions (£2,093,590) registered in the books of the governor and company of the Bank of England. The cash in the hands of the bankers is £478,586. The permanent guarantee fund stands at £150,000, and the balance £162,983, making together £312,983 in excess of the liabilities; the whole amount being invested in consols. The subscriptions and deposits withdrawable on demand amount to £5,883,572. The surplus funds (which are invested in readily convertible securities) are sufficient to pay the depositors 111⅝ per cent. on the amount of their deposits. The new accounts opened during the year were 13,752, and there are altogether 67,244 shareholders and depositors on the books. Since its establishment, the society has returned to the shareholders and depositors £135,309,265, the whole amount having been repaid upon demand. In dealing with these large sums, entrusted to the society by the public, the directors have exercised the utmost care and caution. They have refrained from locking up the whole of the funds in ordinary building society mortgages, with repayments spread over a number of years, and therefore unavailable in time of pressure; at the same time, they have not neglected this department of their business, having advanced to members on mortgage, since the foundation of the Society, £2,464,645. They have, however, adopted what they consider the wise policy of investing a very large proportion of the deposits in Consols, Indian, Colonial, and Corporation stocks, and other liquid securities, available at the shortest notice, to meet any emergency that could arise in times of public financial embarrassment and distrust. The practice has been to retain large cash reserves, and to invest one-third of the deposits in consols, and the remaining two-thirds in other liquid securities and freehold ground rents. The directors venture to submit that no better proof of the soundness of this policy, and the strength of the society's position, could be afforded than that given by the manner in which it met the run brought about in September last, by the collapse of the "Liberator" and its allied companies. In the early days of that month, the office was besieged by members and depositors anxious to withdraw their money. Every facility was afforded them, the office hours were even extended for this purpose, and not a single applicant was disappointed, every claim being met on demand. The panic lasted eleven days, and during that period £1,578,005 was withdrawn. The sudden demand was met by a sale of a portion of the society's consols, pending the realisation of which the Bank of England advanced £500,000, and there were, besides other convertible securities in hand, sufficient to have paid every depositor in full. This becoming generally known, the panic subsided. A large proportion of the money withdrawn was re-deposited, and attracted by the evidence of stability thus afforded, the number of members and depositors has largely increased, and the directors have every reason to believe that the Birkbeck now stands higher than ever in public estimation. The consols sold during the panic have been repurchased, the advance made by the Bank of England has been repaid, and the business is now pursuing its normal course. So large has been the amount of deposits received since the panic, that the directors have thought it prudent to reduce the rate of interest on deposit accounts from 31st March, 1893, to two-and-half per cent., a step which they believe has materially strengthened the position of the society, and which will enable them in the future to invest a still larger proportion of the funds entrusted to them in consols and other British Government securities.

NOTES AND QUERIES.

MEADOW-PIPPITS.—Last year a pair of these birds built their nest within the boundary-wall of Walton Gaol, and successfully brought off their young. This season they nested again within a couple of yards of the old nest, but after five eggs were laid the nest was found, and the eggs taken.—*J. A. Wheldon.*

LOCAL MOTH.—When botanising at Wallasey in April I saw large numbers of a sluggish moth clinging to the stems of *Salix repens.* I sent a couple to my friend, Mr. Walker, of York, who found them to be the local *Nyssia zonaria* (belted beauty).—*J. A. Wheldon.*

COMMON SHELDRAKE.—Does this handsome duck breed amongst the sand-hills on the coast of Lancashire? To-day (May 29th) I observed a flock of nine near Hightown. They allowed me to approach within about twenty yards, and then flew off to sea. Their note of alarm reminded me very forcibly of the "laugh" of the red grouse.—*J. A. Wheldon.*

I WITNESSED a very unusual sight a few days ago. Opposite my window some children were gathered round one of the poplar-trees, in a state of excitement. This tree has been in a sickly condition for some time, from the bark being damaged. From it hundreds, if not thousands, of insects were hurrying away, and spread themselves over a considerable distance around. On examination I found them to be young woodlice (*Oniscus asellus*, Lin.), in a variety of sizes, and very active. We have often observed birds searching this particular tree, but concluded they were looking for spiders; it would now appear that what must have been a large colony of woodlice were the objects of their affection. Like other crustaceans they carry their eggs in a thoracic pouch, and I have often seen a large family of new-born children huddled together on the under side of the mother. The number of the parents who took possession of our poor tree and terminated its existence must have been prodigious. The sequel is noteworthy—in about seven days after the above incident the branches began to appear reddish in colour, and very soon an extensive fringe-like silk hung all around them and continued to spread with rapidity; this I find to be a fungus, and enclose you a sample, which is a stranger to me. Anyway, it would appear that, like rats leaving a sinking ship, the woodlice appeared to know their time had expired in that habitat, and retired, leaving it to its more destructive enemy. So it would appear that after all death only prepares the way for a new generation of life, as in this case.—*F. W. Lean, Manchester.*

A Snake Story.—A huge cobra was discovered the other evening, among a heap of new tiles, by the workmen engaged in the building of the grand-stand at the Havelock Racecourse, Ceylon. As usual with natives, and Buddhists in particular, at sight of the cobra showing fight by erecting its hood, they were anxious it should sustain no hurt, and were for allowing it to glide quietly away, when one of the assistant engineers of the Colombo Commercial Company, who happened to be about the place, promptly settled the matter by flinging a brick at it. A comic element was introduced by a coolie on the roof of the building being the only one who shouted out entreaties that the cobra should be killed, the man being quick enough to discern the risk he was exposed to if the cobra glided up to him in his defenceless position. Besides the fact that the cobra is considered one of the high-born ones among the reptile aristocracy, it augurs good luck for one to be found guarding any premises, hence a hooded cobra often escapes unhurt.—"*Pioneer Mail*," *Allahabad.*

A Physical Phenomenon.—According to a correspondent of "The Calcutta Englishman," a strange physical phenomenon has taken place in the village of Moismira, in the subdivision of Amta, India, causing considerable sensation among the villagers. Suddenly a crack about a cubit in breadth and seven or eight cubits in depth opened out in the ground south of the temple of Babu Hem Chunder Ghose, extending to the bank of the Damudar river, a distance of about a mile-and-a-half. The villagers attributed the occurrence to the anger of the diety presiding in the temple above alluded to, and intend offering up sacrifices and prayers in order to avert any impending calamity.

Colour-Blindness.—Is colour-blindness a product of civilisation? It exists to the extent of three to four per cent. among the civilised peoples of Europe and America, and is known to be a result of violent concussions, or disease, or the excessive use of tobacco and alcohol, but it is chiefly congenital and incurable. The question arises how far it exists among savage races, and Messrs. Blake and Franklin, of the University of Kansas, have tested several hundreds of Indians belonging to different tribes, at the Haskel Institute, Lawrence, Kansas, with the result that under one per cent. are colour-blind. There were 285 males and 133 females, both full and half-bloods, of the Pawnee, Cheyenne, and Pottawatonie tribes. Only three cases of colour-blindness were found among them by Holmgren's test with Berlin wool, two for red and one for green, and these three were full-blooded Indians. The half-breeds, however, seem to show a limited sense of colour, as they often hesitated in their choice. The fact that there is less colour-blindness among women than men, and more among civilised than uncivilised races, would appear to show that the use of tobacco and the habits of civilised life are favourable to its extension.—*Globe.*

Lion-Tigers.—The breeding of lion-tigers has been undertaken by the Royal Zoological Society of Ireland, whose success in the rearing of lion cubs is said to have been quite remarkable. Within the last few years this society has supplied to kindred institutions one hundred Irish lions. They now promise to supply the expected demand for hybrids, and thus a curious new industry will become the means of developing an unlooked-for addition to the resources of the country. A considerable amount of biological interest is attached to the experiment.

A new forage plant has appeared in the form of the *Polygonum Saghaliæ*, which grows in the island of Saghalicn, Japan. It shoots very fast, and in three or four weeks is over six feet high, and covered with large leaves, of which cattle are very fond. When cut it rapidly pushes a second growth. A single plant covers more than a square yard, and the weight of leaves is stated to exceed eighty pounds. The new plant has been tried experimentally at Alliers, in France, and is said to require little or no care.

Butterflies in Captivity.—I believe that butterflies have seldom or never been known to breed in captivity. If they could be induced to do so, some interesting experiments on hybridisation might be carried out. Now it seems to me that one very probable cause of the fact is, that these insects are very rarely kept alive in captivity for any length of time, and at first they are so puzzled and excited by the novelty of their surroundings that they take no notice of their companions. If they were kept for a week or so, till the novelty had worn off, and then introduced to one another, the case might be different. And, as a matter of fact, I never found the least difficulty in keeping butterflies alive. I have had experience of the following species:—*P. machaon*, *P. brassicæ*, *P. rapæ*; *H. janira*, *H. hyperanthus*; *V. atlanta*, *V. io*, *V. urticæ*; *L. alexis*, and always found it perfectly easy. The insects even show some faint glimmerings of intelligence; they soon become familiar, and extend their trunks to be fed when approached; when a finger is presented they will sit on it, and expand their wings; and one specimen of *P. rapæ* which emerged from the pupa in the house in December, and which I kept till April and then released, used even to play with the cat. The most convenient food I found to be sugar mixed with water to form a syrup of about the consistency of glycerine. They need not be fed very frequently; four or five times a day is quite sufficient. When first the sugar and water is offered, the insect, especially if not hungry, may not recognise it as eatable. In this case, it is necessary to teach him to eat it. The insect should be caught firmly behind the thorax, by the roots of the wings, and his trunk should be unrolled with a pin, very carefully, to avoid injuring it, and the end dipped into the syrup.

As soon as he tastes it he will suck, and will recognise the syrup in future; I have never found it necessary to repeat the lesson.—*J. R. Holt.*

ANIMALS DURING THUNDER.—In May there was a severe thunderstorm here, but little rain, and what fell was warm. Peal succeeded peal, and yet, during the while, the birds never ceased singing. Indeed I heard a blackbird whistling during a peal. On the other hand, horses exhibited great uneasiness. I had a smooth collie-dog which, whenever it heard thunder turned, if by my foot, and ran home, pushing itself under the bed. But the most remarkable instance I have to relate was that of a cow which was the first to leave the field during thunder, and low piteously to be admitted into the byre. It was a delicate animal, and therefore required to be milked thrice a day. It had a great love of its mistress, and put its head over her shoulder with a view to be stroked and petted. It would never drink muddy water.—*J. Shaw, Tynron, Dumfriesshire.*

THE GOLDEN ORIOLE.—In the July number of SCIENCE-GOSSIP it is stated that the golden oriole was observed in Dorsetshire at the end of May, and of course the usual fate of being shot befel this beautiful bird. All lovers of Nature must feel deeply grieved to find that, in consequence of such vandalism, the race of beautiful birds is fast dying out, and this, in spite of the Wild Birds' Protection Act, which is supposed to protect such birds as the golden oriole absolutely from March to August. The slayer of this bird is perhaps unaware that he was offending against the law of the land, and that he ought to have been fined twenty shillings and costs.—*Wm. O.*

THE HUMMING-BIRD HAWK-MOTH (*Macroglossa stellatarum*).—This moth is of common occurrence in our village this year; its favourite haunt is a stone quarry; it also frequents the jessamine. I should like to know if other readers of SCIENCE-GOSSIP have observed it in some numbers this year.—*E. W. Swanton, Bratton St. Maur, Somerset.*

THE CUCKOO.—Some years ago I found a nest of the grasshopper warbler containing four eggs and a cuckoo's egg. So far as I have read, I believe this species has not been recorded as one in whose nest the cuckoo lays. The nest was placed in a thick bush some two feet from the ground, in a farm-road two miles below Nutfield, Surrey.—*Hy. J. Turner,* 13 *Drakefell Road, Hatcham, S.E.*

NOTES FROM WEST CUMBERLAND.—On July 1st I took a fine specimen of the Grayling butterfly (*Hipparchia semele*) on St. Bees Head. Is not this an early occurrence? The only other locality in the county, that I know of, is the sandhills at Silloth. On the Head I also saw many common blues, meadow browns, small heaths, burnet, and many other small moths. *Helix aspersa* is very abundant in the neighbourhood of Whitehaven, but near Carlisle I never saw it, although I searched diligently. *Helix nemoralis* and *rotundata* are also very numerous.—*Jas. Marray, Whitehaven.*

POLYPODIUM CALCAREUM.—I have to thank Mr. H. C. Moore for his remarks on my note in "SCIENCE-GOSSIP" for May. The locality he cites from the "Herefordshire Flora" is identical with mine, but is wrongly described as the Red Daren. It should be the Black Daren. I am pretty sure that there is no *P. calcareum* in the Red Daren, which is a short distance to the north. Since writing my note, I have, in company with a scientific friend, carefully examined the Black Daren Rocks, and can find no calcareous deposit in any of the springs, and no trace of cornstones. The rocks are typical old red sandstone, which of course does not imply that they are absolutely free from lime. The Herefordshire side I do not profess to know well, but I have lately been several times across the mountain-country lying between the Black Daren and Crickhowell in various directions, and think, if *P. calcareum* occurred in that district, I should have found it. The nearest habitat of that fern, which I know, is on the mountain limestone above Llangattock (Crickhowell). In June we searched the Cwm Yoy Daren, where the conditions are similar to the Black Daren, but found neither *P. calcareum* nor *Polystichum lobatum* there. The growth of *P. calcareum* in the locality in question is not to be explained by the presence of calcareous tufa or cornstones, and it seemed to me sufficiently curious to induce me to ask whether any of your readers had found it elsewhere growing freely on non-calcareous rocks.—*Thomas Jones, Newport.*

THE CHAMELEON.—M. A. H. may be interested in my observations of a chameleon which was brought to me from Spain in June of last year. Sometimes it was almost black, and when on cold nights I kept it in a basket lined with yellowish flannel the creature was found to assume the same hue. It was mostly of some shade of green or brown, or a mixture of those colours; but occasionally it was black with orange or other coloured spots. One side of the brain seems to act independently of the other, and the chameleon can literally sleep with one eye open. The separate action of right and left nerves may explain the fact that one side of the reptile is often of different colour from the other. The tongue is as long as the body, and has a sticky fluid at the tip. It was amusing to hold the chameleon within sight of a fly, and see it dart out its wonderful tongue with unerring aim and great rapidity. At first the creature avoided me, but soon learned that I was a friend. One day the chameleon would eat one sort of insect, and another day refuse the same and prefer a new diet. On cold days it would not eat, so I feared to keep it during the winter, and sent it to the Zoo, where it died in April, surviving its fellow-prisoners. As it can live a long time without food, a popular fallacy has arisen that it subsists on air; so people often keep a chameleon and do not provide it any nourishment. My chameleon changed its skin in October. This, as well as all its habits, was most interesting. Its attitudes are so varied from the extraordinary way in which its limbs seem to tend any way. I have many sketches of these queer positions. On hot days I left my chameleon free in the garden, but my task of watching it and endeavouring to go on with some other pursuit wanted the peculiar faculty of divided visuality so comical in the creature itself. I give my address in case M. A. H. may like to write and ask further particulars.—*R. E. Higgins,* 93 *Wellington Street, Luton.*

SACCHARINE.—Immense results were, a few years ago, anticipated from the remarkable discovery of a substance very much sweeter than sugar. This was saccharine, one of the derivatives from coal-tar. That the vast expectations then indulged in have not been realised may be inferred from the fact that there is now, in all the world, only one factory wherein saccharine is made, and that on a very limited scale. For a few years after the announcement of the discovery there was a small demand for the article, but this was chiefly for the gratification of a natural and laudable curiosity which is not yet quite satisfied. Not one of the important applications for which the substance was supposed to be suitable has led to an increase in the demand. The advantages which were at first claimed for saccharine are precisely the same as those which are still urged in its favour, and yet the public does not seem to be impressed by them. The most obvious of these favourable considerations is the smallness in bulk of the new product as compared with the magnitude of sugar packages. But this is not of necessity an advantage. Alcohol is of small bulk as compared with light wine, but the latter is very much preferable, and commands the market. Beef is bulkier than its essence, and yet has not gone out of fashion. Common salt maintains its ground against more intense salinities. Theine is the most concentrated form of a refreshing drink, but it is not yet infused for the five o'clock cup. When it comes into fashion, perhaps saccharine will be employed as a sweetener, but not till then. Nicotine is the most intense of narcotics, but no one puts it in his pipe to smoke it. Even opium and haschish are looked upon askance by those who indulge in the bulkier weed. The sugar crop of Cuba is expected this year to amount to 1,000,000 tons, but the fact that it will take a thousand ships to bring it away is not regarded as a detriment, and nobody cares to inquire how many kilogrammes of saccharine will be produced by the little German factory. It is also a curious thing that it is found advisable to increase the bulk of saccharine by mixing with it a quantity of bicarbonate of soda to diminish its objectionable sweetness. It is also claimed as an advantage for saccharine, that it possesses a certain amount of antiseptic power. But so does sugar, in so far as it preserves the flavour of fruit in the form of jam, and supersedes some of the salt required for the curing of hams. Saccharine jam would be decidedly objectionable on account of its want of bulk, while it would be double the price, weight for weight. A scrape of saccharine jam would certainly not be relished by the juveniles, who are good judges of the genuine article. Another of the recommendations of saccharine is that it is non-fermentable, but this should be set down as a drawback, since it makes the luxuries of coal-tar brandy, whisky, gin and beer unattainable, to say nothing of the so-called non-intoxicant temperance drinks. Saccharine yeast might be appreciated for bread-making, but it is not to be had. The fourth of the advantages promised by the discovery of saccharine is its value as a medicine, sugar being held responsible for the infirmities of diabetes and fatty degeneration; but this promise also has not been kept, or else medical men have failed in their duty of making its virtues known. Sufferers from diabetes could always refrain from the use of sugar, as Banting did in order to reduce his fatness; and yet these ailments continue prevalent. It is just possible that sugar has been libelled in this matter. In diabetes, sugar is found in the urine, but it has not been shown that the sugar has its origin in the patient's food. Fatness is sometimes a disease, but as lean people are in the majority there is no reason why they should not take the means to fatten themselves. Saccharine has been recommended for the sweetening of nauseous medicines, and this point may be conceded in its favour, as it is a drug rather than an article of food. An attempt is being made in America to restore saccharine to its original popularity. Dr. Falhberg has taken an interest in this movement, and it is to him that I am indebted for the recapitulation of the virtues of saccharine. The owners of the German manufactory have promised that if they receive sufficient encouragement they will set up a second factory in the United States. What response the Americans will make to this offer remains to be seen; but in the meantime the consumption is trifling.—*Melbourne Leader.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—All notes or other communications should reach us before the 8th of the month in order to *insure* their insertion in the following number of Science-Gossip.

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 to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

EXCHANGES.

Duplicate sets and eggs of oyster-catcher, ring plover, eider duck, shieldrake, common and lesser tern, sparrow-hawk, lesser redpoll, wheatear, etc. Desiderata, razorbill, shag, cormorant, guillemot, etc.—Mr. George Ratcliffe, 3 Baldwin Street, Hawcoat, Barrow-in-Furness.

Science-Gossip for 1888–92 (sixty numbers), in fair condition. Offers.—T. E. Sclater, Natural History Stores, 43 Northumberland Place, Teignmouth.

Wanted, Science-Gossip for 1881. I will give the following rare numbers in exchange: February 1865, January, February, October, and November 1866, November 1878, and from January to August of 1889; or Phillip's "Geology" will be given for the above.—P. J. Roberts, 11 Back Ash Street, Bacup.

Wanted, really good collection of postage stamps; also side-blown eggs of goldcrest and curlew. Offered, large number of choice skins, eggs of echinoderms, British shells, Science-Gossip, handsomely bound, from commencement, etc. State desiderata.—Charles Jefferys, Naturalist, Tenby.

Offered, clutches of chough, sparrow-hawk, kestrel, dipper, stonechat, goldcrest, rock-pipit, grey wagtail, goldfinch, twite, hooded crow, nightjar, c. sandpiper, woodcock, snipe, water-rail, merganser, mute swan, little grebe, gannet, cormorant, shag, ringed guillemot, razorbill, puffin, c. tern, swift tern, sooty tern, noddy, herring-gull, Manx shearwater, storm-petrel; nests with many. Wanted, good clutches not in my collection. British list.—R. J. Ussher, Cappagh Lismore, under Cahir.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Physical Review" (London: Macmillan & Co.).—"Journal of Conchology" (Leeds: Taylor Bros.).—"The Canadian Entomologist" (London: London Printing and Lithographing Office).—"Practical Solid Geography," by J. Payne (London: Thos. Murray).—"Le Micrographe Préparateur" (Paris: J. Tempère).—"Reports of Observations and Experiments" (Washington: Government Printing Office).—"Naturalists' Journal" (London: Elliot Stock).—"Natural Science" (London: Macmillan & Co.).—"Natural Food" (London: Fowler & Co.).—"The Geological Magazine" (London: Kegan Paul, Trench, Trübner & Co.).—"The Midland Naturalist" (Birmingham: Cornish Bros.).—"The American Microscopical Journal" (Washington: Smiley).—"The Microscope" (Washington: Microscopical Publishing Co.), etc., etc.

Communications received up to the 10th ult. from: E. A. M.—E. W. S.—W. H.—W. O.—H. J. T.—J. M.—T. J.—T. R.—T. E. S.—A. A.—J. E.—McP.—R. T. S.—H. A. G.—J. B. R.—G. G.—J. M.—etc., etc.

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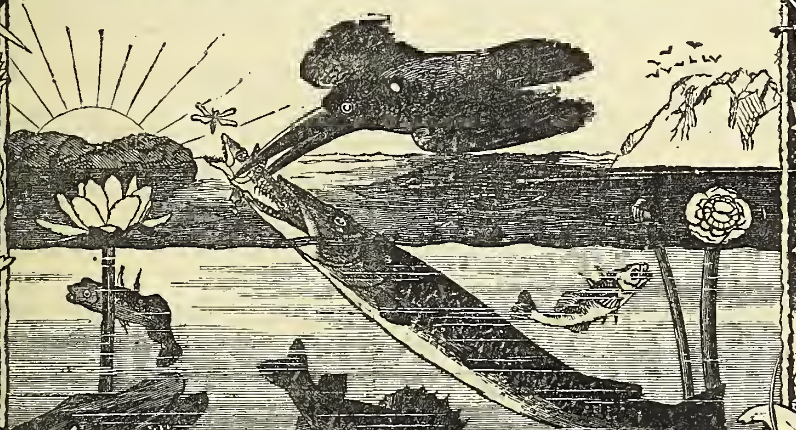

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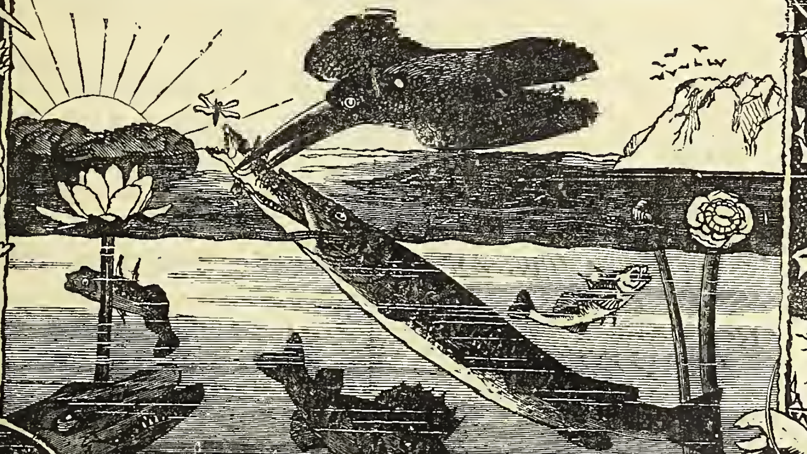

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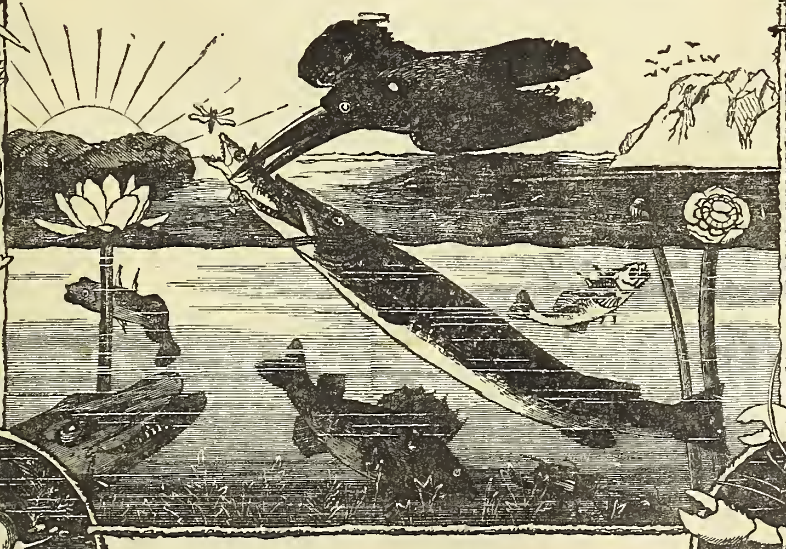

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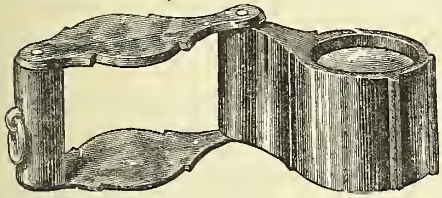

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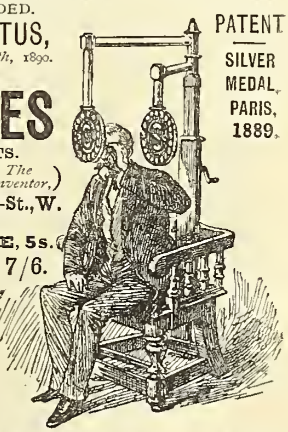

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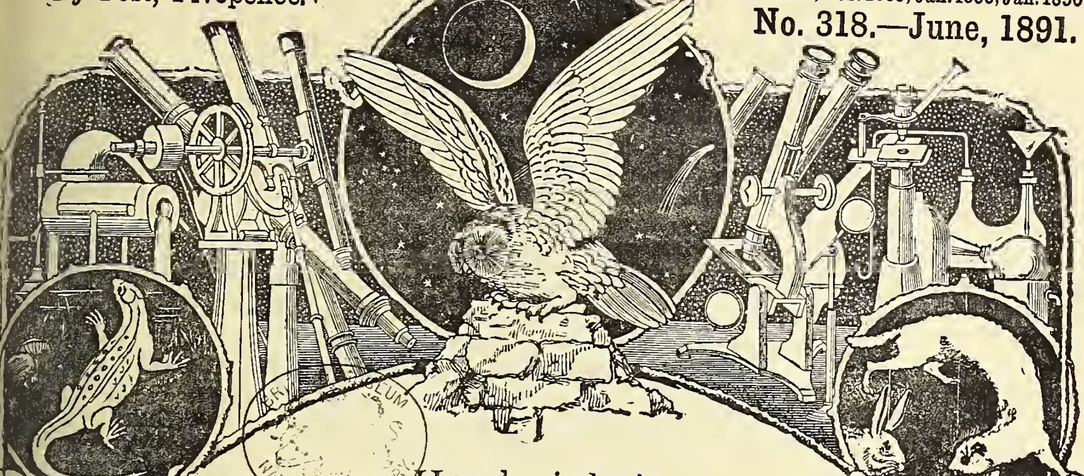

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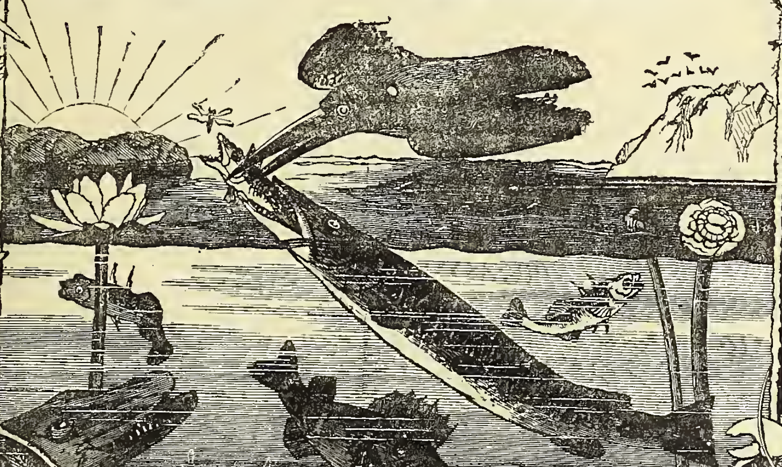

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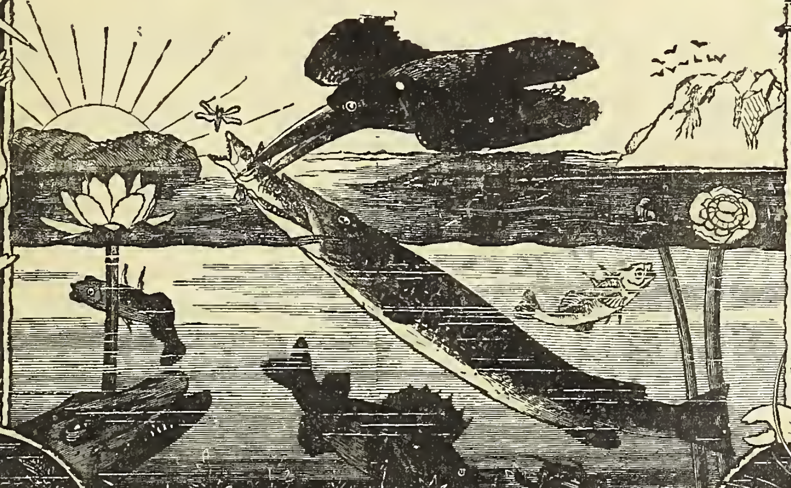

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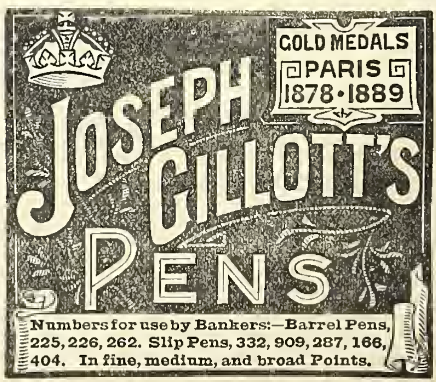

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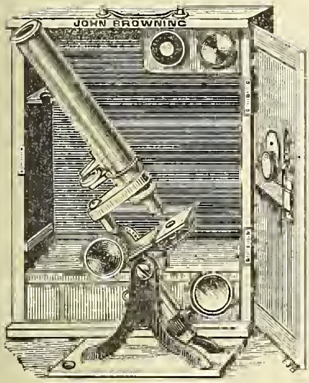

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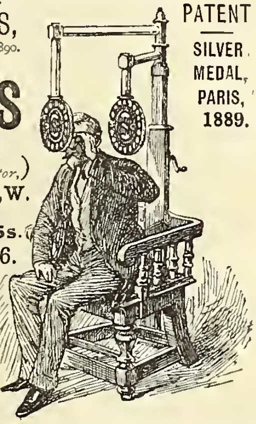

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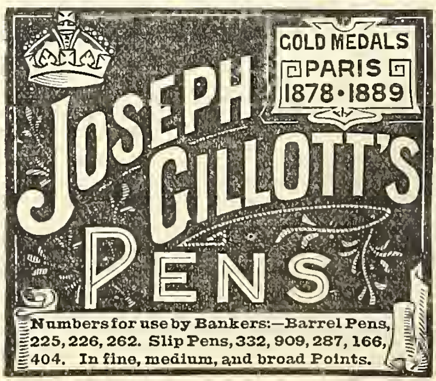

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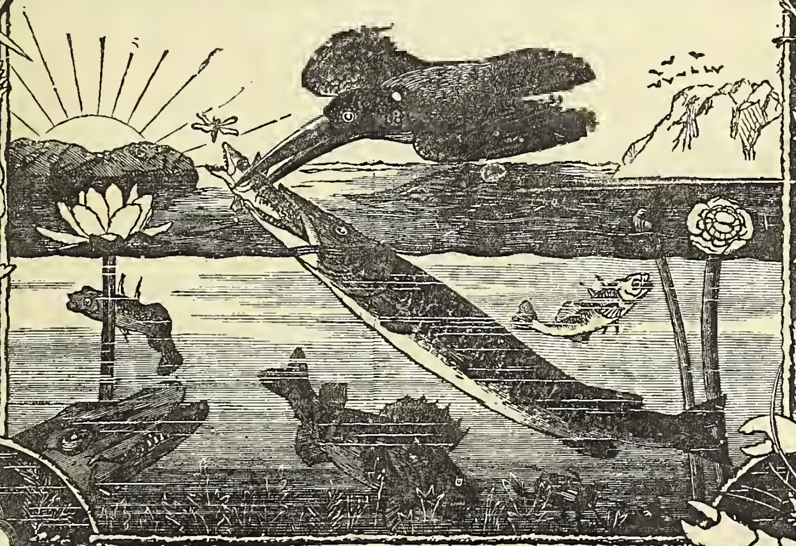

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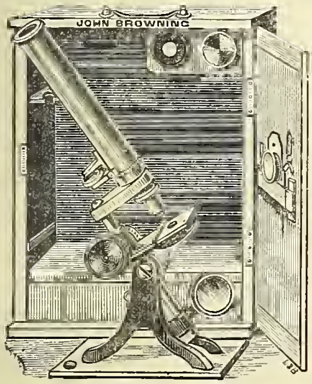

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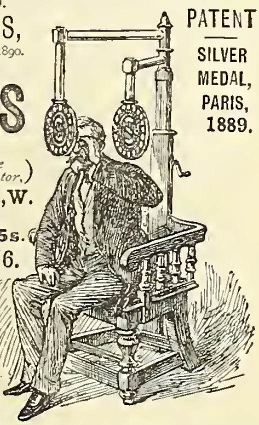

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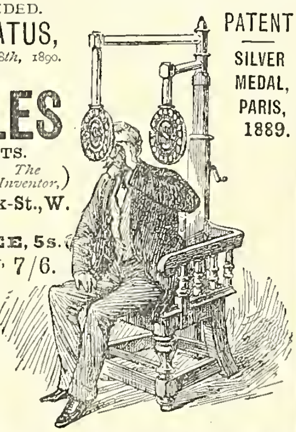

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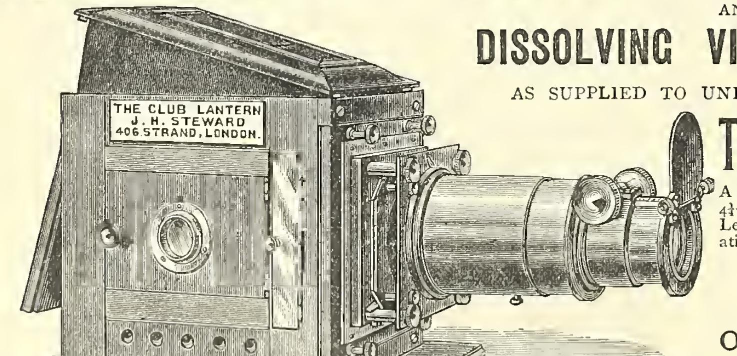

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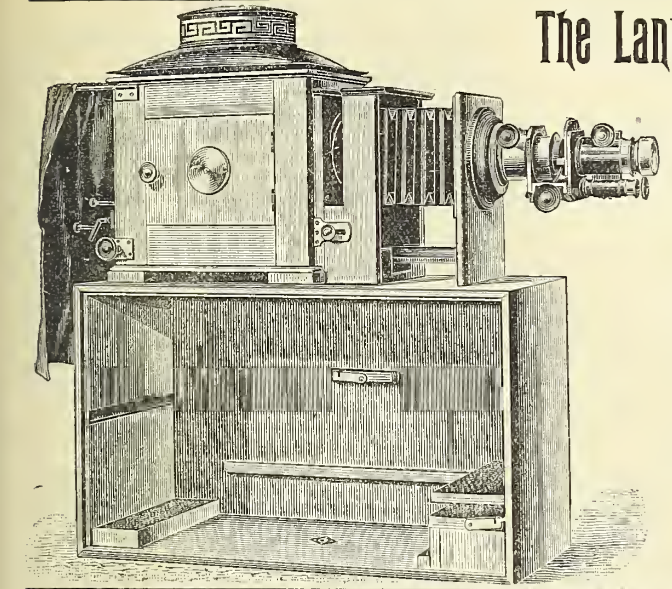

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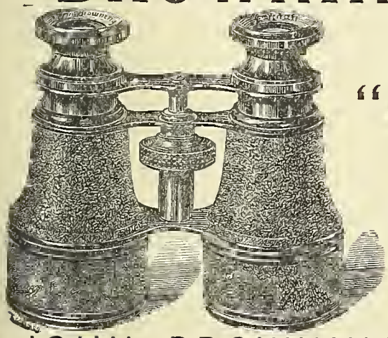

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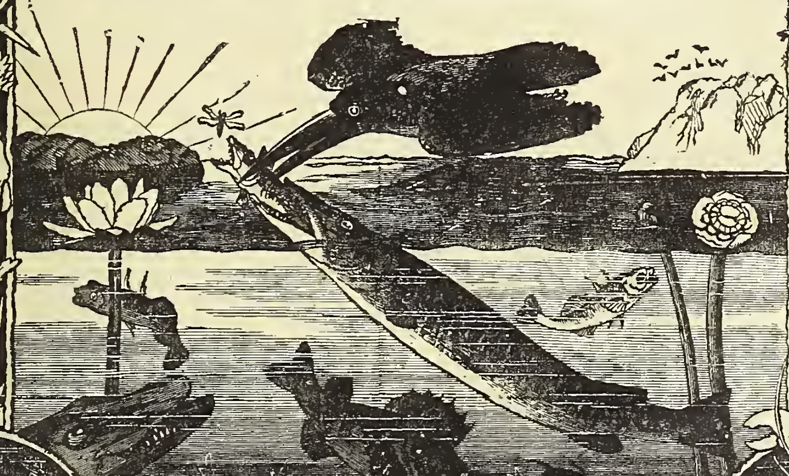

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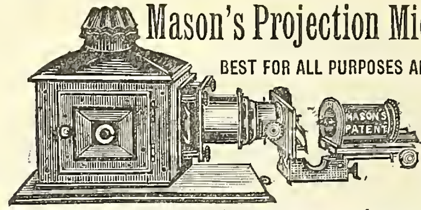

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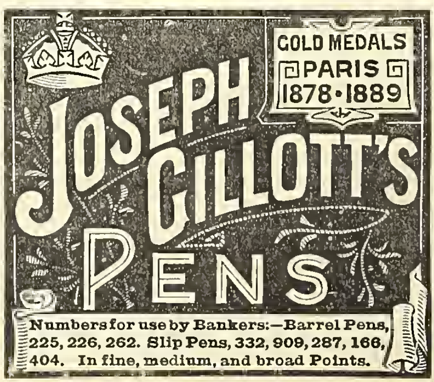

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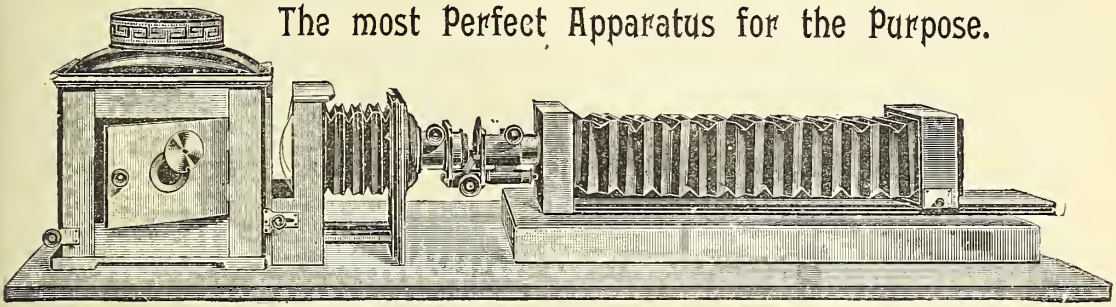

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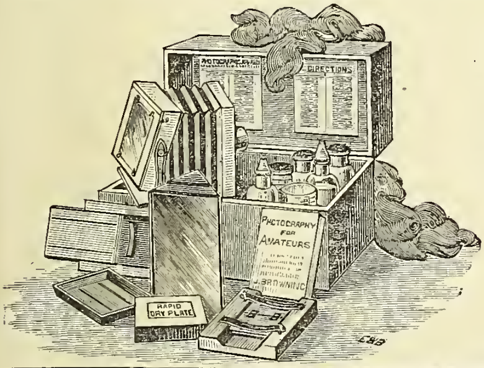

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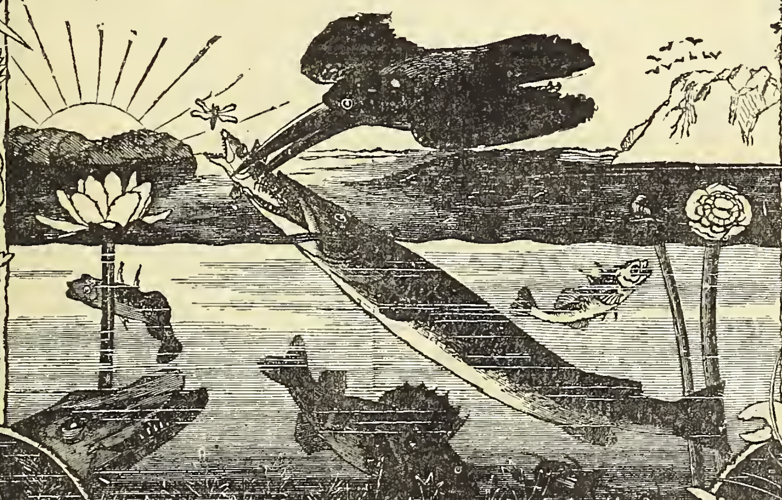

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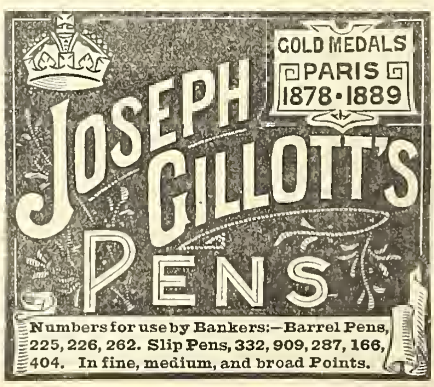

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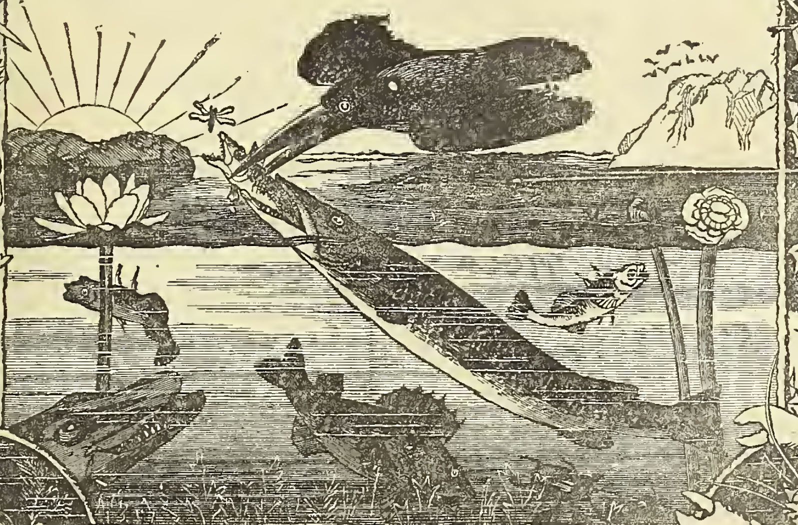

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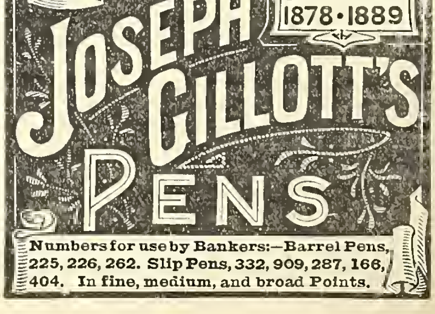

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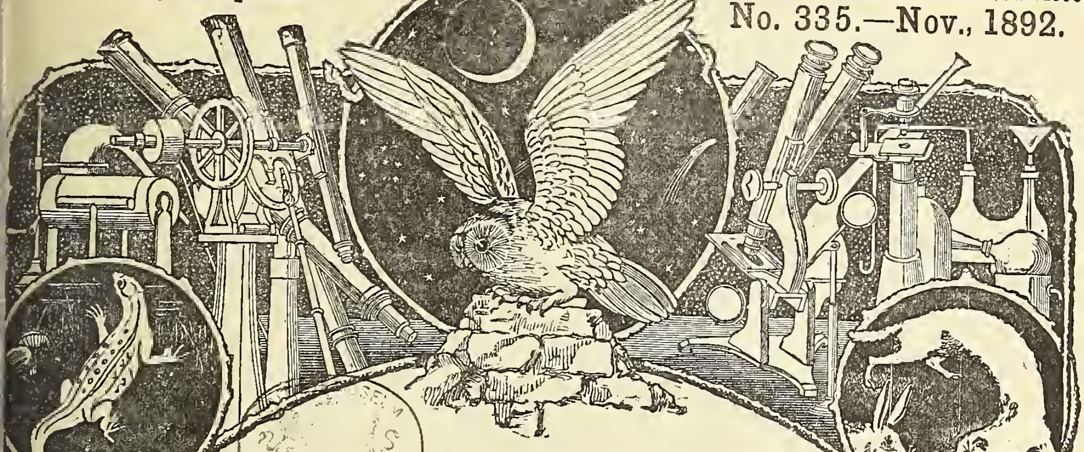

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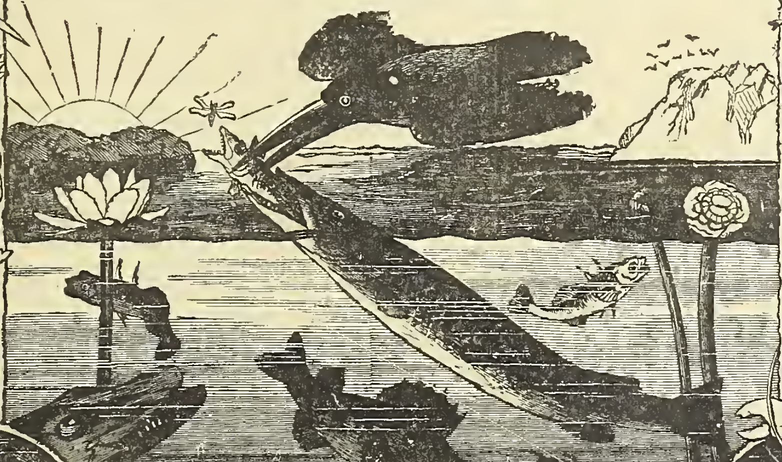

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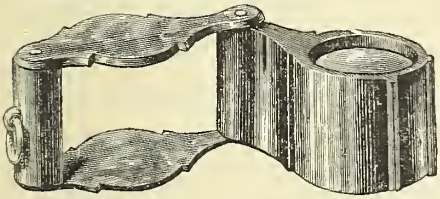

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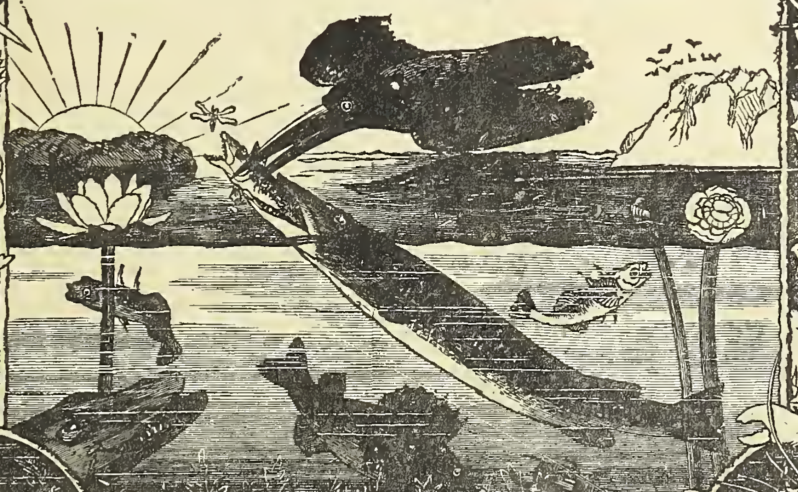

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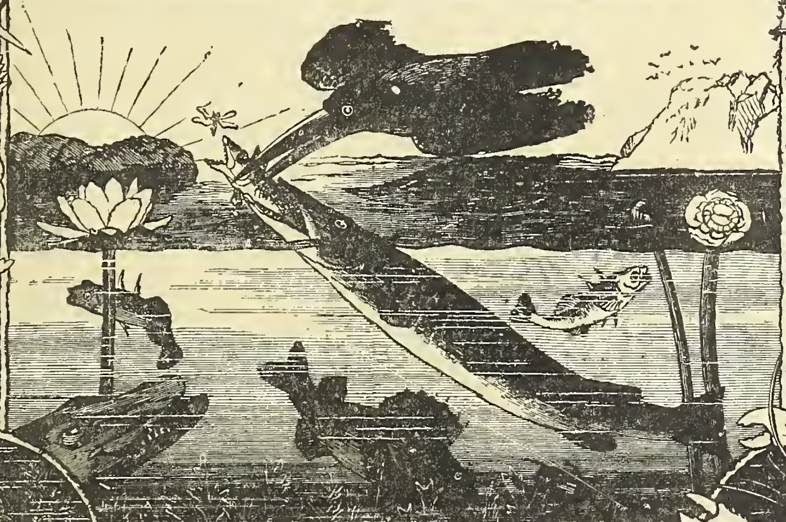

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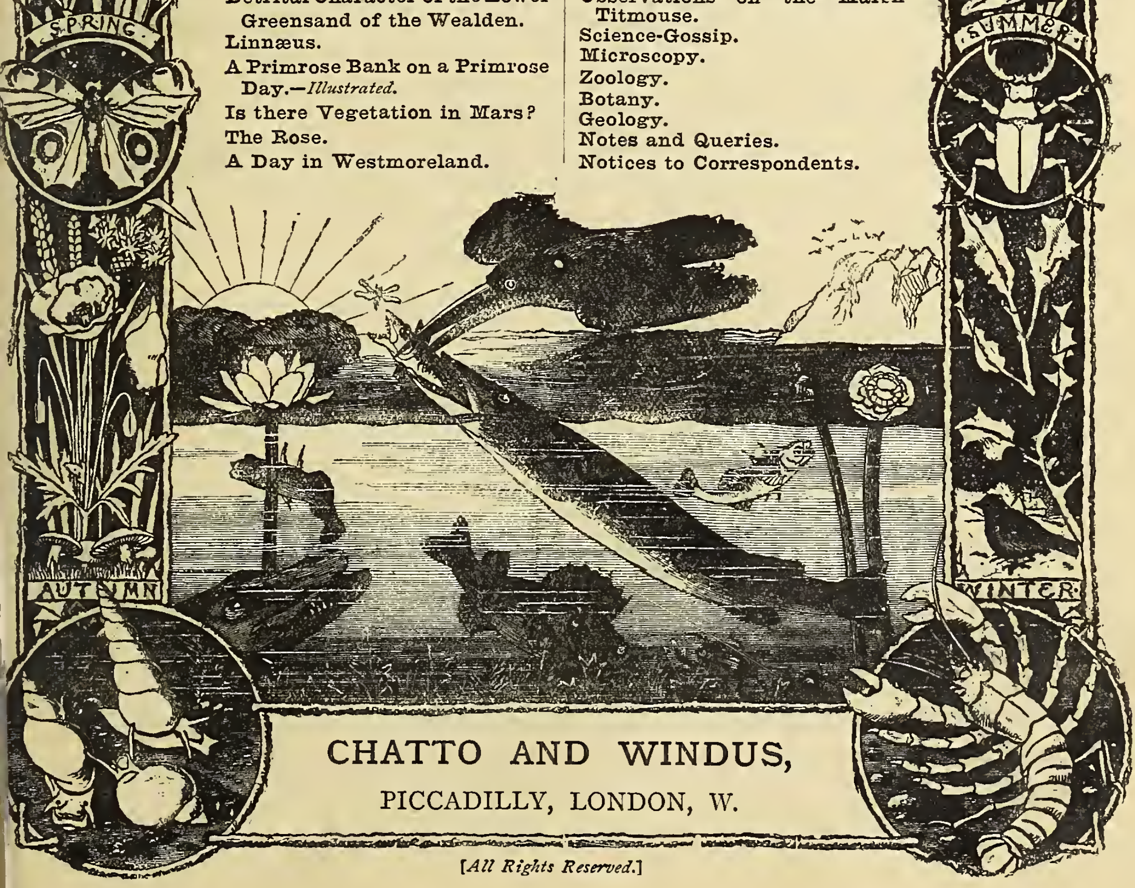

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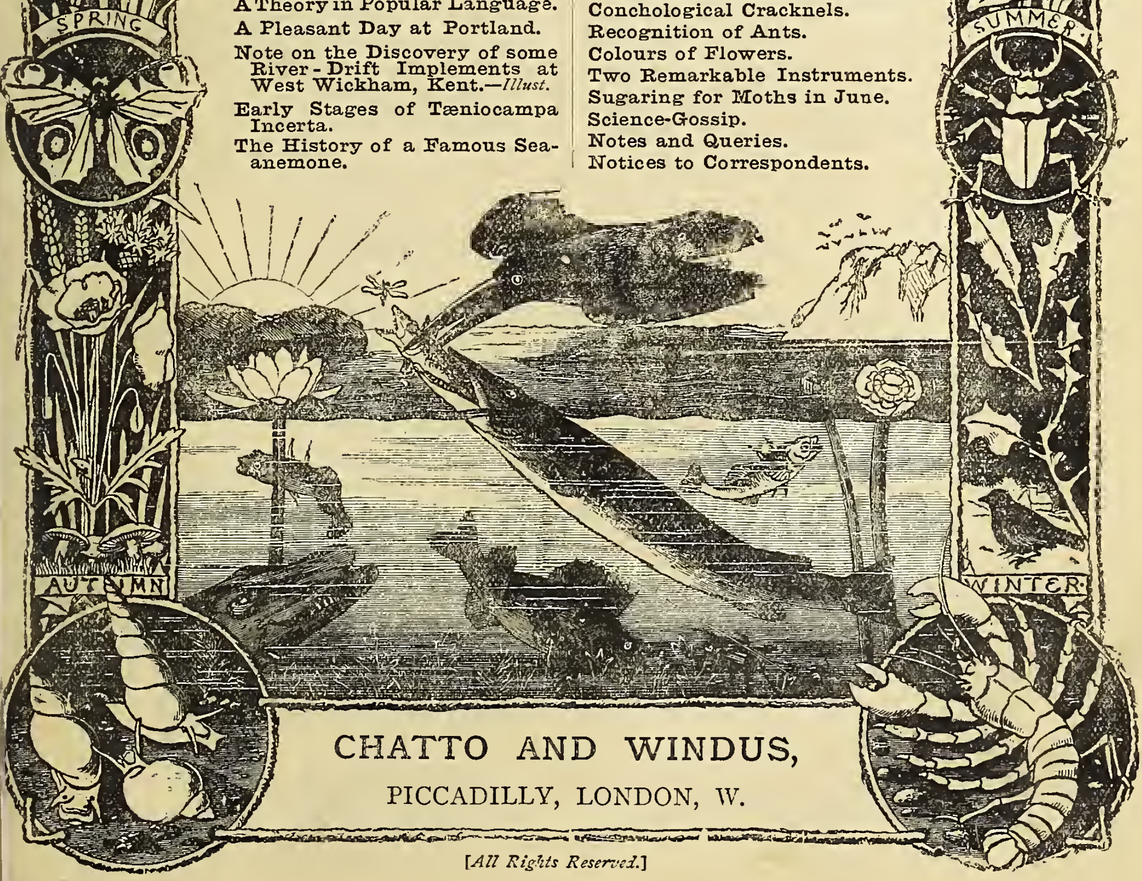

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