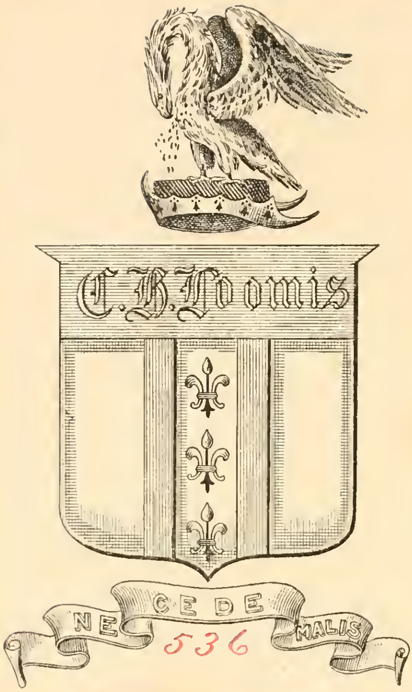
SCIENCE GOSSIP.



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HARDWICKE'S

SCIENCE-GOSSIP:

1888.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

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PREFACE.

TWENTY-FOUR years have elapsed since this Magazine was founded by the genial publisher whose name it still bears. It is a long life for so popular a serial as SCIENCE-GOSSIP, but has there been any flagging in its vitality? Many honoured names, both in amateur and professional science, have helped to build up its world-wide reputation. It has been the ladder by which many distinguished men have climbed to fame. Scores of others who have helped our Magazine have passed away. Though they rest from their labours, their works follow them; and not a few of their articles are sought out in back volumes for the wisdom and experience they generously placed at the service of the public, and especially at that of the young naturalists who were to succeed them.

In spite of the little bickerings and breezes we experience, even in scientific circles—the accumulated heritage from ancestors who knew not science—is there a single profession or calling in which men are so willing to help each other as in natural science? Our columns bear evidence to the prompt readiness with which young beginners, and even more advanced students, obtain assistance as soon as they ask for it.

The spheres of science are ever widening, like those of a disturbed lake. There is little fear the function of SCIENCE-GOSSIP will die out for lack of fresh information. Every new discovery opens out fresh vistas, and calls forth additional comment and criticism. We claim that, from the popular point of view, our twenty-four volumes give as complete and even a more continuous History of recent Science than can be found anywhere else. Our severest critics will admit that the present Volume is in no wise inferior in variety, interest, and

information to its predecessors. Our generous contributors of articles are quite as enthusiastic as their forbears.

The increased demand on our "Exchange Columns" is a good indication of the rapidity with which Natural History has spread. That term is now more comprehensive than ever. It embraces sections and sub-sections of research which, a quarter of a century ago, were hardly thought of. Now, every one of them is engaging the attention of men and women, and sweetening their lives, as the eager interest shown for Collecting manifests.

We would do more if we could. The low price of SCIENCE-GOSSIP makes it imperative that its circulation shall be increased, so as to enable Editor and Publisher to carry out their desires. Every reader can assist us by joining our enthusiastic corps of "recruiting sergeants," and getting another enlisted in our large ranks of Subscribers. An increase of another five thousand per month in our circulation would strengthen our hands for good.

We thank kind friends all round (and there is not a part of the globe where our Magazine has not friends) for help, sympathy—even criticism. The Preface enables the Editor once more figuratively to shake hands with all, and to wish them a HAPPY NEW YEAR!

LIST OF ILLUSTRATIONS.

SECTION-CUTTING APPLIED TO INSECTS.

BY H. M. J. UNDERHILL.

WITHIN the last few years the art of section-cutting has been greatly improved, but accounts of the methods in use have as yet hardly found their way into ordinary microscopic handbooks, and to the amateur, who modestly restricts his dissections to insects, they are, I believe, almost unknown. The general principles of the methods are in all cases the same, but the application of them to various sorts of tissues is frequently different; so, in working out the details for insects, although I write chiefly for the amateur, I may possibly contribute something of use to the student.

Most microscopists find that a great deal of the interest of their microscopy lies in preparing specimens. If there be any one of these who has never tried section-cutting, let him buy a microtome and set to work at once. It is quite a fascinating amusement, a kind of refined "whittling a stick"—that pleasure so dear to youth.

After a few remarks on microtomes, I propose to divide my observations into four parts; Preparing the specimens; cutting, mounting, and staining them. I would premise that, if I recommend a process for insects, it does not follow that it will do for anything else.

The most important thing in getting perfect sections is the proper preparation of the insect, previous to cutting it. If an object be well prepared, good sections may be obtained with the commonest of microtomes; of course, the better the microtome, the better the sections: yet the best of microtomes is useless, if the specimens be not rightly prepared. Section machines seem to vary in price from 8*s.* to £8. As far as I know, the cheapest are practically as good as those of medium price, for when cutting is effected by holding the razor in the hand, one can never be sure to the $\frac{1}{500}$th of an inch where its edge will come, in consequence of the elasticity of the steel. This is the arrangement in all the moderate priced instruments I have seen, so that a £2 machine is not essentially better than an 8*s.* one. In the more expensive forms this uncertainty is eliminated by the motion of the razor (or object) being effected mechanically. The best of these is said to be the Cambridge "Rocking Microtome," price £5 5*s.* I have got very good sections with a section machine of the cheapest kind, and I have seen most excellent vegetable sections which were cut without a microtome at all. So the student need not lay aside section-cutting for lack of an expensive machine. A good razor, however, is a necessity.

PREPARING SPECIMENS.

A great many fluids have been compounded for hardening tissues previous to cutting them. Some do very well for insects, but any which contain chromic acid are totally destructive. This reagent renders chitine extremely friable, and in fact, makes the whole section so brittle, that it is hardly possible to mount it unbroken. Moreover, in spite of all said to the contrary, it prevents proper staining. But the fluid readiest to hand is common methylated spirits, and this answers every purpose. Soak the insects in it for a week or two, or as much longer as you like. Soft bodied insects may shrink if put into methylated spirits at once. A day's previous soaking in dilute picro-sulphuric acid solution will prevent this. Then let them have three or four days in absolute alcohol, changing the alcohol once. Transfer them to oil of

cloves, in which let them stay for a day; and, after the oil of cloves, let them be in turpentine another day. For some reason that I do not understand, soaking first in oil of cloves and then in turpentine prevents tissues from shrinking when they are put into wax. If oil of cloves, turpentine, or chloroform be used alone, shrinking can hardly be avoided. For this "wrinkle" I am indebted to Dr. Schönland, of the Botanic Gardens, Oxford.

Now melt some paraffin wax before a gas-stove or over a water bath. Be very careful to have it only just above its melting-point. Warm the bottle of turpentine containing the specimens, pick them out, and drop them into the melted wax. This must be maintained at the same temperature for about ten hours. Great care must be taken not to let it get too hot, or the insects will shrink. If you put the specimens in at night, they will be ready by morning. By this time the wax should have penetrated every part of the insect, and the excellence of the sections depends upon this being done completely. No perfection of microtome will compensate for imperfectly imbedded specimens; but, as I have said, you can cut good sections of a well-imbedded insect in a common machine. This method of imbedding answers for most insects, but very soft ones need yet more care to avoid shrinkage. Either of the two following methods will do. Put the insects into a small open vessel with enough turpentine to cover them, add a good many chips of wax. Or this: melt some wax in the vessel and let it get cold; put the insects with enough turpentine to cover them on the top of this. Then (in either case) gradually bring the wax to the melting-point before the stove or in a hot-air box, and keep it just melted for hours until the turpentine is all evaporated. The penetration of the wax is so gradual, that there is no danger of the insect shrinking.

The vessel in which the wax is allowed to get cold must be flat bottomed; and the objects should be arranged in it at intervals in such positions that the bottom of the vessel is at right angles to the plane of the sections which you intend to cut. When the wax is quite hard, the specimens may be carefully cut out in little cubes of wax, and kept for any length of time until wanted.

The wax used must be pure paraffin. I have tried all sorts of mixtures and different waxes, but nothing does so well as pure paraffin. It is of great importance to have it of the right melting-point. The Cambridge people say that with their microtome this does not matter, but my experience with the machine is different. If the temperature of your room be 56° to 60° Fahr., the proper melting-point of the wax is 110°. You should have a thermometer, and, whenever you want to cut sections, you must bring the temperature to this point. In summer, when you cannot cool the air to 60°, you must use harder wax, preserving the difference of 50° between the temperature of the room and the melting-point of the wax. The reason for this particularity is that, if the wax be too hard, the sections will curl up as you cut them, and frequently break. On the other hand, if it be too soft, it gives way under the pressure of the razor. Any grocer will get you paraffin through Price's (or some other) candle company. It is made of four degrees of hardness, melting at 110°, 115°, 120°, and 125°. The probable price will be 6*d.* per pound.

Cutting the Sections.

If you have a microtome of the common sort, with a well, fill the well with melted wax, and let it get quite cold. Then screw it up until about half-an-inch of wax appears above the cutting plate of the instrument. Remove this with the razor, and if the block of wax seem at all loose in the well, thrust a thin splinter of lucifer match between the wax and the side of the well. Take now one of the cubes of wax containing an insect to be cut; square it roughly with a pen-knife; fasten it to the wax in the well by means of the heated blade of an old knife. When it is cold and hard again, finish off the squaring process accurately, taking care that the opposite sides are parallel. Screw down the machine until the top of the little cube is level with the surface of the cutting plate, and the specimen is ready for cutting. Take off a few preliminary slices, and when you have cut down to the object, place the razor with its edge parallel to and almost touching one of the sides of the cube. Draw it sharply towards you without any motion sideways, but in a direction exactly at right angles to that side of the block with which its edge is parallel. Let the section remain on the razor blade, and after again turning up the screw of the microtome, repeat the cut, using exactly the same portion of the razor edge to cut with by placing the section already cut precisely behind the little square block of wax. The new section will stick to the edge of the first one and push it across the razor blade. The same process, indefinitely repeated, will produce a ribbon of sections almost as neatly as a rocking microtome will do it. Success depends on the melting-point of the wax, and the temperature of the room, being properly adjusted, as before explained.

After a little practice, I could readily get unbroken ribbons of 20 to 40 sections. After this, they became too long to be manageable. The advantages of ribbons over single sections I consider to be two:—they are much easier to manipulate; and they facilitate getting a series of sections in their proper order. This is an important point when you are cutting up an insect. Besides, having all the sections cut before any are put upon the slide, you are able to count them, and so calculate the space they will occupy. You can, therefore, arrange them with proper regard to the middle of the slide—a great thing to all who love neatness.

Mounting.

In the ordinary way of mounting sections, they are loose, and must be transferred with a "section lifter" of some kind from fluid to fluid, as they are washed and stained. This is very troublesome and risky with any sections, and impossible with insects, because they always break up. The safe way, and at the same time the way which produces the best results and is also the least trouble, is to fasten them to the slide as soon as they are cut, and then there is no risk of breaking them. This is done by brushing the face of the slide with a mixture of four or five parts oil of cloves to one part collodion, spreading it thinly and evenly, and covering a little larger space than the section will occupy. Some people prefer glycerine and white of egg, spread very thinly. I lay my slides on a card, the size of a slide, ruled in the middle into squares $\frac{1}{10}$ of an inch in diameter. Take up a length of ribbon by placing the blade of a scalpel underneath it, and, guided by the card, put the end section down at the right place on the slide, gently draw away the scalpel, and flatten down the ribbon on to the slide with the back of the blade. See that every part of every section touches the glass and is held by the cement. When all the sections are arranged, take hold of one end of the slide with a clip, and hold it over a flame for a few moments until the wax is melted. The melted wax and the oil of cloves draw away from the sections and form a ring of drops round them. These should be wiped off, because they take the colour when the slide is stained. Plunge the slide into turpentine. A few seconds suffice to dissolve the wax and oil of cloves, and the sections remain on the slide, held fast by the collodion. If staining be unnecessary, or if the object has been stained whole, the turpentine should be washed off with benzine, and the slide mounted in balsam thinned with benzine. If the objects are to be stained on the slide—and this method, I think, gives the best results—proceed as follows. Remove the slide from the turpentine, and wipe off as much of it as possible; pour a few drops of absolute alcohol on the sections; and, when this has dissolved out the turpentine, put the slide into methylated spirits. It is best to let it soak in this for a quarter of an hour at any rate, in order to extract all the turpentine. Transfer it to clean water, and soak it in that another ten minutes or so. Now stain, leaving it as long as is necessary in the colour. But, if you wish to remove pigment to show the structure of eyes or other pigmented parts, the slide must be left in *eau de javelle* until all the pigment is dissolved, and then well washed in water, before being stained. The time needed for staining is generally fifteen minutes, but the slide should be examined frequently to see how it is getting on. The sections must not be overstained if hæmatoxylin be used; for, although overstain can be washed out with acidulated spirit, or aqueous alum solution, the sharpness of outline given by the colour is decidedly impaired. After staining, the slides must be brought back to balsam by a reverse process; viz., by passing them through (1) water; (2) methylated spirits; (3) absolute alcohol; (4) benzine; (5) mount in balsam and benzine. Turpentine and oil of cloves should not be used for No. 4 (benzine), because they cause many colours to fade, which benzine will fix. Glycerine is not a good mounting medium, for my experience of it is that all stains fade in it.

All these directions may sound very complicated to the tyro, but the method of mounting is really very easy, because the sections are fixed to the slide. There is, therefore, no danger of their floating away when the cover is let down on them, and no trouble with air-bubbles.

Staining.

A few words on staining may be useful. As I have already said, specimens may be stained whole, before they are imbedded in wax, or stained on the slide after they are cut. Some like one way, some the other. I find it difficult to stain the object whole to just the right tinge of colour; I either get it too dark or only partially stained, and it is specially difficult with insects because of their impervious shells. If you make holes in them with needles, you damage the internal anatomy. Therefore, I prefer staining the sections on the slide, in the way that I have described.

All sorts of colours have been recommended. Aniline dyes are in great favour with some people, and very nice double stains of vegetable sections may be made with them. Borax, carmine, and picro-carmine are much used. These colours are much better than aniline dyes, in that they stain less diffusely and more "selectively," as it is called. But I reject them, because with any objective higher than a quarter-inch, they give no sharpness of outline.

I use hæmatoxylin, and hæmatoxylin would be the perfection of stains, if—it is a great pity, that "if!"—it did not labour under the suspicion that it fades in a year or two. That it fades sometimes there is no doubt; but it is doubtful if the fading be due to the fault of the colour, or to the reagents used in preparing the specimen. It certainly fades if the specimens have been hardened in chromic acid, or any chromate; and I know that turpentine causes it to fade. I have great hopes, however, that, when the specimens have been hardened in simple spirit, washed finally with benzine, and mounted in balsam and benzine, the colour will keep. Some slides that I mounted six months ago in this way show no sign of turning colour as yet; but six months, of course, is a test not long enough.

A friend of mine, who is very skilful in mounting, says that he considers the cause of the fading of

hæmatoxylin to be, not in any reagents used in preparing the specimens, but in the presence of tannin in the ordinary hæmatoxylin stains. His recipe for preparing the stain so as to get rid of the tannin may be found in the "Quarterly Journal of Microscopical Science," 1885, at the end of an article on the "Eyes of Insects."

Perhaps tannin, chromates, acids, and turpentine all contribute to make it fade. My own recipe is as follows; it gives as good results as any hæmatoxylin I have ever seen; but if fading be because of the presence of the tannin in the logwood, my slides will fade in time.

Crush ordinary extract of logwood to powder, and dissolve a saltspoonful of it in hot water; add about ¾ oz. of methylated spirit; dissolve a teaspoonful of alum in some more hot water, and mix the two solutions; add more water (if necessary) until the bulk equals three ounces. Allow the fluid to stand for some hours; then filter. Keep it a week before you use it, and then filter it a second time.

I have lately stained a few slides with "Carters'" blue-black ink, diluted with water and spirits. It gives very good results, and colours specimens either a pleasant blue-black, or (if you leave the slide a couple of hours in water or spirit after staining), a gray, like the tone of a photogravure. The definition is not quite so sharp as that given by hæmatoxylin, but I have a retina of a spider excellently well stained by it. As I have only used it for a very short time, I should not venture to recommend it as anything very first-rate, but I think it decidedly worth trying. On the other hand, nothing can beat hæmatoxylin if it will only not fade.

I keep my fluids—turpentine, spirits, and the stains—in three-ounce, wide-mouthed, corked bottles. These are tall enough, and the mouths wide enough to take a slide. And so, by dipping the slides first in the one bottle, then in another, as required, the trouble of mounting is greatly reduced. It is a clean process; there is no waste; and yet you always have ample quantities of fluids. If you have two bottlefuls of each kind in use, you can have six or eight slides in the course of preparation at once.

In conclusion, a hint or two as to the sort of insects to choose for cutting into sections will not be amiss. Those with hard chitine should be avoided, for, not only do their shells notch the razor terribly, but they also crush into the softer parts while the section is being cut, and so spoil it. Small insects are much more easily cut than large; long and cross sections of whole insects are very instructive. Eyes are very interesting, and spiders are particularly good subjects. And, as comparatively little has been done in "sectionising" insects as yet, there is room for the enthusiastic entomologist to discover new facts, and so do a little original work.

Oxford.

FORMS OF CLOUD IN RELATION TO THEIR COMPONENT PARTICLES.

"WE shall have stormy weather, sir; those animal clouds have been about again to-day." Such was the remark made to me by a country woman in Kent, and this observation was true enough to nature: it agreed also with my own notes at the time on the appearance of "Anvil cloud," or *fracto-cumulus*. The "Ram's-head" cloud might not inappropriately be the term used to describe this drifting bank of hail or rain, which often marks the sky with such striking and fantastic outlines. Observe these dark rolling masses at sunset on an autumn afternoon, and see what kind of weather the night brings with it—driving sleet, and sudden gust of wind, with "bursts" of hail rising often to a furious and full-blown nor'wester, such as makes one thankful for a good roof overhead.

The general form and type of the "Hail cloud" is pretty well known to observers of atmospheric phenomena. In most cases it greatly resembles the snow-cumulus, though generally more craggy in outline, harder in its edges, and more attended by stratus * at its base. There are, however, several types of snow-cloud. When drifting against a clear sky, the latter presents a more fleecy and softer edging, though in its general form it must be grouped, like that which originates hail-showers, with the class of "Animal" cloud, *i.e. condensed* † *Fracto-cumulus.* Both of these are again closely akin to the Electric cumulus, or Cone-cloud (see SCIENCE-GOSSIP for July, 1879). This is natural enough when we recollect the frequent connection existing between the hail-shower and electrical discharges, and the part that electricity is known to play in the condensation and cohesion of the watery particles.

Let us notice now that a "law" seems to hold good in regard to the origin of the different forms of cloud, and that this law is the real principle by virtue of which it is possible to forecast weather from the observation of clouds. This relation, which we may term a "law of correspondence," between the particles composing a cloud and the general form of the mass, varies its manifestations with the temperature and other physical conditions of the medium in which the vapoury particles are floating: yet the principle involved in the connection between the form of the body and the molecules which compose it is constant.

It is a physical or chemical question to determine the special forms that will be originated by given component particles under given physical conditions. To determine such resultant forms, in the case of previously unknown substances, is a problem

* This indicates a closer affinity with the rain cloud or nimbus.

† This is the term adopted by Professor Poëy, and indicates a mass broken by wind.

difficult in the highest degree, and I suppose practically insoluble in the generality of instances, except where an approximating form may be guessed at, by witnessing the evolutions that result from analogous substances.

To forecast, for example, the general form which would be assumed by an aggregation of the crystals of some hitherto uncompounded chemical, would be an impossibility, except by examining the effect of known combinations almost similar in composition.

Still more difficult would it be to suggest the form likely to be taken by a tree, from an examination of the seed, though even here analogy *might* suggest something. But it could suggest nothing as to the method of development with regard to the arrangement of particles, nor as to the reason of their taking the particular form under observation. The seeds of two different plants may be exceedingly alike in general structure and composition, yet the form of their leaves and stem will present the widest possible diversity.

Yet in considering the process of growth, we must not overlook the variety of elements which may be absorbed from the earth and atmosphere. It is not a question of the simple evolution of a given material into an organism from a given embryo, but of the drawing into a focus or vortex a great variety of elements, operated on by an almost equal variety of forces. The laws which regulate the operation of those forces are the laws which originate the various forms that meet our eyes, and produce a resulting structure characterised by permanence and beauty.

An Owen may rebuild, from the fragments presented to him, the frame of a being long extinct, whose remains lie imbedded in the bowels of the earth, and we accept his construction because we believe it to be based on the order of Nature shown by the exact observation of analogous forms. But even Owen's efforts to reconstruct would be simply abortive, and the result a falsity, were it not for the permanence and continuity of law in Nature. Without the operation of such law within the component particles, no species either in the animal or vegetable world could possibly possess "continuity" of form.

It is sufficient for our present purpose to direct attention to the relation existing between "mass" and "particle." But it is also necessary to point out that there must always be a great defect in the value of illustrations from the mixing of liquids of differing density, such as those adduced by the late Professor Jevons. The movements and elasticity of the atmosphere vary too greatly from ordinary "liquids" to allow of experiments in mixing being of much practical value in regard to known forms of cloud. And in addition to mechanical movements we have earth magnetism to deal with, which, from its known connection with auroral manifestations, may not unreasonably be thought to influence the aggregation of vapour.

SAMUEL BARBER.

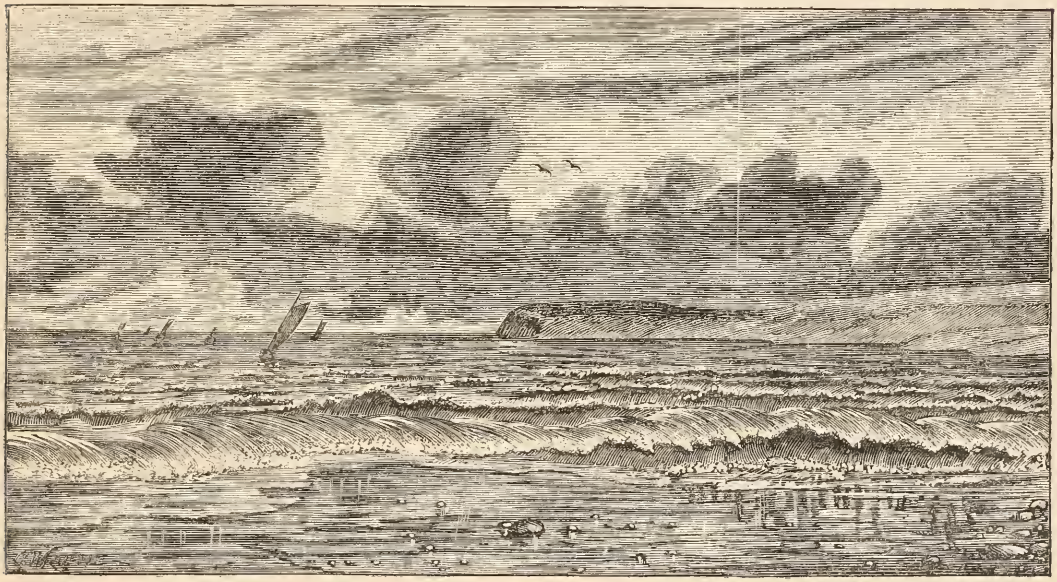

Fig. 1.—Anvil Clouds.

ONE of the last new things out is a watch whose face can be lit up at night by a small electric lamp. This will prove a useful watch for seafaring men.

CHAPTERS ON COLOUR.

By S. A. Notcutt, jun., B.A., B.Sc.

No. I.

THE natural starting-point in this subject is the colour of ordinary bodies and pigments which we see by the aid of external light, usually white light. This light, on passing through a prism is, we know, split up into the prismatic colours, forming what is called the spectrum; and thus we learn that sunlight is composed of rays of light of almost every different colour. On holding a piece of red glass in the path of the rays as they issue from the prism, the green and blue portions of the spectrum disappear, leaving little else than red, for the red glass absorbs the green and blue rays.

Similarly, blue glass would absorb the yellow and other rays, and, in fact, with various glasses and coloured solutions, we can absorb any particular set of rays we like, and in each case the rays that remain after this process of absorption constitute the particular colour of the glass or solution.

This is the case with transparent coloured bodies. In the case of an opaque body, such as a pigment, a portion of the light falling on it is reflected at the surface, and as a rule is not changed in colour; but another portion penetrates the substance, and since the internal structure of such a substance is always irregular, this portion of the light is soon reflected back; however, in passing and repassing through the superficial layer of the substance, it suffers absorption, and hence issues forth as coloured light, the colour being what we recognise as the colour of the body.

In a leaf a very thin layer of the colouring matter, chlorophyl, is sufficient to absorb all the orange, blue and violet rays contained in the incident light; hence the light reflected back from the interior of the leaf is without these rays, and since the remaining rays together constitute a green light the leaf looks green.

"Thus," says Tyndall, "natural bodies have showered upon them, in the white light of the sun, the sum total of all possible colours; and their action is limited to the sifting of that total, the appropriating from it of the colours which really belong to them, and the rejecting of those which do not. We may therefore say that it is the portion of light which they reject, and not that which belongs to them, that gives bodies their colours."

It is sometimes convenient to be able to compare by means of a diagram the light transmitted by two different media. This is usually accomplished by taking a rectangle to represent the solar spectrum, and in it drawing a curve, the ordinates or distances measured upwards for any point of the curve representing the amount of light which is transmitted of that particular part of the spectrum.

On comparing the diagram of the light reflected by green pigment with that of the green light from vegetation, we find a considerable difference (Figs. 2 and 3). We see that besides a quantity of yellow and green being transmitted by the foliage green, a portion of the extreme red is also transmitted. If we therefore cut off the yellow and green light coming from foliage, we should expect it to appear red, and this is seen to be the case on viewing a garden or field through glass stained a deep blue with cobalt. In sunlight a piece of yellow glass should be added, to cut off the extreme blue and violet.

A sunny landscape viewed through these two glasses presents a curious appearance: green trees and plants are a red colour, the sky is greenish-blue, the clouds purplish-violet, and anything orange appears blood-red. The absorption diagram of these two glasses shows that they cut off almost all the green light furnished by leaves, but transmit the bluish-green rays which leaves do not furnish.

An interesting phenomenon depending on absorption is that known as dichromatism, which is the variation in the apparent colour of an absorbing medium when different thicknesses are used. Thus the colour of a solution of litmus enclosed in a wedge-shaped glass vessel, varies from blue at the thinnest part to red at the thickest. Chromium chloride varies from green to red; potassium permanganate from purple to blue; reduced hæmoglobin from green to purple. Several thicknesses of yellow glass appear red.

This phenomenon depends on the principle that if a certain thickness, say one centimetre, of a medium absorbs a certain proportion of the rays, then the same proportion of the remainder of the rays will be absorbed on passing through another centimetre of the medium. In the case of litmus, suppose that in the incident light there are one hundred blue rays to every ten rays of such wave length, that they are partially transmitted by the solution, whilst rays of any other refrangibility are completely absorbed; then after passing through an extremely thin layer, the emergent light will be a deep blue, the proportion of blue to red being ten to one, and the red being thereupon scarcely noticeable. Now suppose that each millimetre of the solution absorbs one-tenth of the red and one-half of the blue rays, then after passing through 1 mm., the light will contain nine red rays to every fifty blue, and after passing through successive millimetres of the solution, the proportion of red to blue rays will be as the table below (taken from Glazebrook's "Physical Optics"), from which it is apparent that the relative intensity of red to blue in the emergent light has altered from a proportion of 1 to 10 to one of more than 3 to 1 as the thickness has been increased to 6 mms., and the light is finally a reddish-purple, which may be made quite red by increasing the thickness sufficiently.

Thickness.	Intensity.	
	Red.	Blue.
mm.		
0	10	100
1	9	50
2	8·1	25
3	7·29	12·5
4	6·56	6·25
5	5·9	3·12
6	5·3	1·56

In the case of most natural bodies, we have seen that the colour is due to an absorption of portions of the light in traversing a small thickness of the substance, and in the subsequent reflection from the interior. In these cases the portion of the light reflected from the surface itself is of the same colour as the incident light. With metals and allied bodies, this is not always the case. In the act of reflection at the surface of a metal, a partial selection takes place with regard to the rays. In the light reflected from a sovereign, yellow rays predominate, whilst the interior of a gold-plated vessel shines with a still deeper orange-yellow, owing to the selection exercised by each successive reflection.

Some metals only exhibit colour on such often-repeated reflections. Light thus reflected from steel becomes blue; from silver, yellow.

Another remarkable feature about metallic reflection, is the *amount* of light reflected; whereas white paper only reflects 40 per cent., polished silver reflects 92 per cent. of the incident light.

It is these peculiarities in the nature of metallic surface which render a gilt frame so suitable for enclosing a painting, since it isolates it from surrounding objects, and does not intrude its own colour upon the painting, since that colour is of a different character to the colour of the pigments used in the painting.

The ordinary colour of metals is then due to the components of white light, which are entirely reflected. If we obtain a sufficiently thin sheet of a metal, we can examine the light transmitted through it; and this, as we should expect, will be of a different colour to the ordinary colour of the metal. In the case of gold, the light at the first surface is robbed of its yellow rays, which are completely reflected, and the transmitted portion consists of blue or bluish-green rays. Gold can be easily precipitated in the metallic state from its solutions, and being then in a very fine state of division, is capable of transmitting light. Such solutions containing precipitated gold, appear bluish-green by transmitted light, and orange-red by reflected light.

There are many other bodies which display similar colour phenomena to metals. In the case of a crystal of permanganate of potash, the light reflected from the surface is green. The crystal itself is almost opaque, so that it is not easy to observe the colour of light transmitted through it;, but we find that the colour of a solution of it is a deep purple, well-known as Condy's fluid. Solutions of the aniline dyes when spread on glass and allowed to dry—so as to leave a thin film of colour—display one colour when we look through them, and another when we observe the light reflected from their surface.

The ordinary aniline ink (used for writing on graphs) is of a violet colour; but light reflected obliquely from the surface of such writing is apple-green. Light reflected from the surface of a film of blue aniline is bronze.

There is another phenomenon attendant on the reflection of light from metallic bodies, which is that the reflected beam is at no angle completely plane-polarised; *i.e.* it always consists of two parts, one plane-polarised, and one not; whereas, with most surfaces, at some particular angle the incident beam is completely polarised.

So far we have dealt with questions of colour involving absorption. Let us now examine the results obtained by the mixture of coloured lights which is quite distinct from the mixture of pigments on the painter's palette. Various methods have been adopted for this purpose. Lambert and Helmholtz used a vertical plate of glass, with a piece of coloured paper placed horizontally on each side, and observed the union of the reflected and transmitted colours. When one of the pieces of paper is yellow and the other red, their superimposed image is orange. With blue and yellow papers the image is grey. Maxwell's colour-top is one of the most convenient methods of making colour mixtures. It consists of a spindle capable of making rapid revolutions, on one end of which coloured discs of cardboard, seven or eight inches in diameter, are placed. Each disc has a radial slit to allow of other discs being combined with it, so that a composite disc can be formed with several sectors of different colours. When such a disc is rotated at from twenty-five to fifty revolutions a second, the sensation aroused in the eye by one sector has not time to disappear before the images of the other sectors are brought to bear, and consequently a complete fusion of the colours takes place. When a yellow and blue disc are combined and rotated, the whole appears a dull grey; vermilion and a bluish-green also yield a grey, as do purple and emerald green. Now a surface is grey which, while it reflects white light, does not reflect so much as white paper or chalk does. Therefore we may say, that these pairs of colours produce by their mixture the sensation of white light of a low intensity. Two colours which do this are said to be complementary. Other colours when combined may produce the sensation of some intermediate colour in the spectrum. For instance, a disc half red and half yellow, when rotated looks orange. A green

and violet disc looks blue; a red and blue, purple. Considering the formation of the sensation of orange in this way: the colour produced is indistinguishable by the eye from the same colour in the spectrum, but whilst the orange beam in the spectrum consists of rays of definite wave-lengths, and is not split up into further colours by passing through another spectroscope, the composite orange beam formed by the mixture of red and yellow rays, consists of rays of quite different wave-length (those corresponding to red and yellow), and is again split up into the original colours that formed it on traversing the large one. When the colour is a bright and intense one, the white or black must be combined with it, that is, must be subtracted from the other three. The amount of the several colours used can be determined numerically by measuring the angle included in each coloured sector, and in this way Maxwell obtained his colour equations.

Maxwell's colour-box is an apparatus by which any two or three portions of the spectrum can be made to overlap, and the resulting light examined. This is by far the most accurate means of determining colour mixtures.

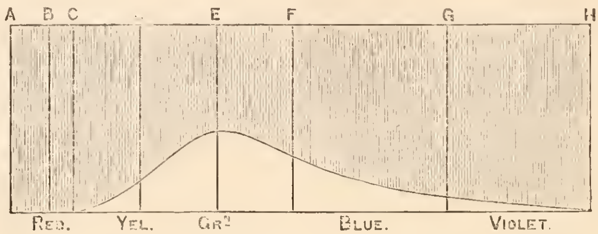

Fig. 2.—Diagram of light reflected from green pigment. (O. N. Rood.)

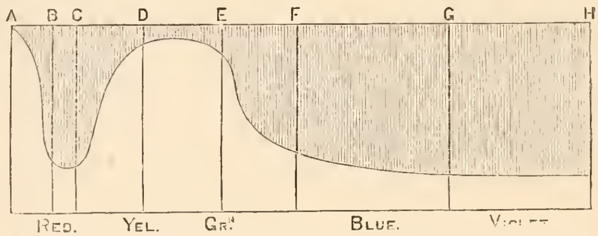

Fig. 3.—Diagram of light reflected by green leaves. (O. N. Rood.)

a spectroscope. In fact it is only the sensation of orange, which is the same as the sensation of red and yellow combined; or, the mixture of red and yellow rays to form an orange sensation is a physiological and not a physical one. Hence we are led to conclude (in the words of Professor M. Foster), "That an orange ray awakens either a simple sensory impulse which developes into a complex sensation, or a complex impulse (formed of impulses corresponding to red and yellow) becoming converted into a mixed or complex sensation."

In this respect the eye differs strikingly from the ear; for two notes, when sounded together, do not give rise to an intermediate note. The ear is able to analyse such complex sounds more or less.

The facts gathered from the above experiments with the colour-top, are included in a more general statement in regard to colour mixture which Maxwell proved to be true; namely, that by combining white or black with any other three colours, which were sufficiently dissimilar, any other colour could be matched. To assist in the comparison a smaller disc of the colour to be matched is set on the face of

FLOSCULARIA ANNULATA.

ALTHOUGH this floscule has not been described, it was found (for the first time) in the summer of 1882, in a marsh pool on Tent's Muir, Fifeshire; but only two individuals were found at that time. I sent both of them to Dr. Hudson, of Clifton. One of them died on the long journey; the other survived, but, unfortunately, arrived in a sickly condition. It exhibited itself often enough, however, to enable Dr. Hudson to draw a very good sketch of it; but it was in so languishing a condition that it died before he could make a satisfactory diagnosis of it. In the summer of 1886, I found a few more specimens in the Black Loch, Perthshire, and this summer (1887) I have again fished a number of specimens out of the same loch; and these have afforded me ample opportunity for studying the creature's habits.

Its corona is a hemispherical cup, whose edge is cut into three lobes of unequal size, the lobe on the dorsal side being the largest. It differs from *F. trilobata* and *F. Hoodii* (whose coronæ also bear three lobes), not only in the form of the lobes, but in the

fact that the tips of the lobes only are crowned with short setæ (Fig. 4 *l*); whereas, with *F. Hoodii* and *F. trilobata*, there are double rows of setæ that run round the whole margin of their corona, a little below which are three bands or rings (Fig. 4 *r*) of a brown colour. The colour is due to granules floating in the fluid between the outer and inner membranes when viewed with transmitted light; but if examined as an opaque object, with reflected light, the colour of the rings is white. (Hence the reason it has been called *F. annulata.*)

At the bottom of the corona, just under the third ring, is the vestibule (Fig. 4 *v*), where is visible (in a good light) a contractile collar, with a horse-shoe-shaped rim, clothed with vibratile cilia (Fig. 4 *cc*), whose motion generates an inward current, which carries with it infusorians within the expanded mouth-funnel. When once a monad has entered into the vestibule corona, there is no escape, for if it please the palate of the floscule, its doom is sealed; for, although the creature will suffer at times one or two monads to swim about in its large mouth, yet at any attempt to pass out over the margin, the lobes are drawn together, and the passage is closed. At the bottom of the vestibule there is a slit with two lips, called the buccal orifice (Fig. 4 *bo*), to which is attached a tube that hangs into a chamber called the crop (Fig. 4 *c*), which moves with an undulating motion.

When the floscule has got one or two monads within the vestibule, the collar contracts quickly, the lips of the buccal orifice dart forward with a snap, and the prey is forced down, one by one, through the tube into the crop. The little victims may be observed wriggling about within the crop until they are caught by a pair of curved jaws which are situated at the bottom of the crop, and the entrance to the stomach (Fig. 4 *i*), which is called the maxillary process.

The action of the jaws is an upward motion, and at the same time they open out to seize the food and drag it into the stomach. It is indeed interesting to witness the operation. Sometimes the jaws close on the spherical body of a monad a little below its centre; and when it so happens that the jaws fail to clutch it, the spherical body rebounds back into the crop, just as a person grasping at an indiarubber ball with finger and thumb a little below its centre, produces the same result. This rebound shows the toughness and elasticity of the cuticula of these minute monads.

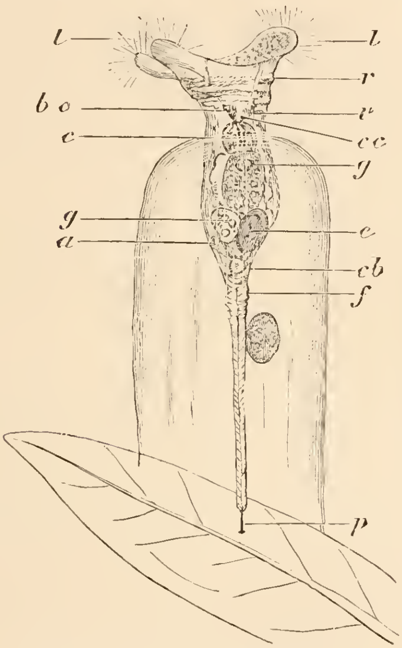

Fig. 4.—*Floscularia annulata*, side view.

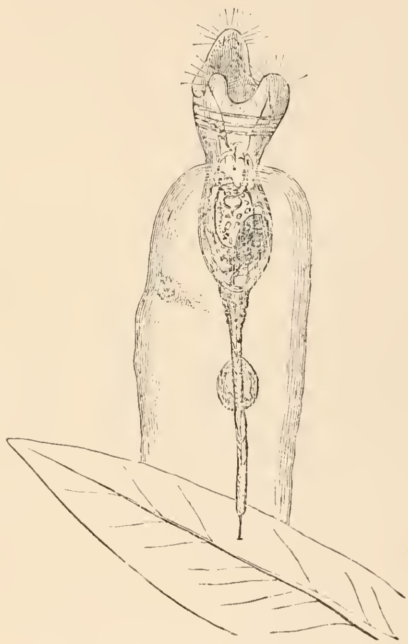

Fig. 5.—*Floscularia annulata*, ventral view.

The jaws assist very little in the mastication of the food, as their function seems to be simply to drag it into the stomach. Digestion seems to be performed wholly in the stomach and alimentary canal, and these organs are lined with vigorous vibratile cilia whose operation serves to triturate the food. The ovary is an oblong sac with spherical transparent germs, but when an egg is well developed (Fig. 4 *g*) it is opaque and fills a large portion of the body cavity (Fig. 4 *e*), and when ready for expulsion the creature retires into its tube. The egg is at first forced half out of the vent, the animal then moves slowly out of

its tube and comes to an erect position with its corona fully expanded. It then remains in that way (if not disturbed) for nearly an hour, and then again retires into its tube to finish the operation of depositing the egg. With some apparent exertion the creature lays the egg well down into its transparent gelatinous tube close to its long foot. The foot itself (Fig. 4 *f*) is long and flexible, and is capable of great expansion and very swift contraction, for on the least alarm the creature retreats into its tube with lightning speed. A longitudinal muscle runs down the whole length of the foot and is strengthened by numerous fine muscular transverse rings from its junction with the trunk to its extremity, where there is attached a short non-contractile peduncle (Fig. 4 *c*) which terminates in a disk which is fastened to a leaf of sphagnum, or other aquatic plant, by a viscous fluid secreted by a gland at the extremity of the foot for the purpose. The respiratory or water vascular system in *F. annulata* is not easily traced, as its trunk is rendered rather opaque by whitish granules that float in the fluid between the outer and inner membranes. But when the creature is kept for two days in clear water without proper food, the creature is so starved that it becomes very transparent, so that the details of the internal organs can be traced with less difficulty. The slender tortuous vessels can be observed leading down to the contracting bladder, situated near the junction of the foot with the trunk (Fig. 4 *c b*). The *F. annulata*, like all the other species of the same genus, inhabits a transparent tube secreted by the animal itself, which not only serves to protect the creature itself from its natural enemies, but also serves as a protection for its eggs from the ravages of aquatic worms and larvæ, for although the material of the tube is tough enough to resist the attacks of a large number of worms and larvæ, yet there are some, especially of the larvæ of the dragon-fly, with their powerful mandibles, which cut through the tube and devour both parent and eggs. The material of the tube is so transparent that the observation of its contents is comparatively easy.

The *F. annulata* deposits from three to six female eggs in its tube, which take about five to six days to hatch. Six or eight hours before the embryo bursts its shell, two red eye-spots are very conspicuous; also a ciliary motion, and a twitching of the whole contents of the egg, are observed. The twitching becomes yet more vigorous, until at last the embryo bursts through its shell and, propelled by a wreath of delicate frontal vibratile cilia, it soon finds its way out of its mother domicile, and swims rapidly round its parent; then strikes out with a graceful motion through the water, poking amongst the weeds in quest of a fitting place to start housekeeping on its own account.

It seems to be rather particular in selecting a site to build its future residence. I have seen one alight on the leaves and axil of a plant in a dozen places, before it made a final selection of a spot to fix its foot; and a few hours after the young floscule was encased in a thin gelatinous tube, with its foot, trunk, and corona (although smaller in size) developed in the same form as its parent.

I have not yet met with the male of *F. annulata*, nor even the male of the other three-lobed species. There are sixteen known species of the genus Floscularia; the males in eight of them only have yet been found, leaving the males of eight species to be discovered.

The males of those that have not yet been found are *F. regalis*, *F. Mira*, *F. longicaudata*, *F. Algicola*, *F. trilobata*, *F. Hoodii*, *F. annulata*, *F. edentata*.

The males of those species that have been discovered are *F. coronetta*, *F. ornata*, *F. cornuta*, *F. cyclops*, *F. campanulata*, *F. ambigua*, *F. calva*, *F. mutabilis*.

The whole sixteen species of the genus Floscularia are inhabitants of fresh water, with the single exception of *F. ornata*, which is now known to inhabit both fresh and salt water. I had the good fortune to find the *F. ornata* very plentiful in tide pools at the mouth of the Firth of Tay in the summers of 1885 and 1886.

The length of full-grown specimens of *F. annulata* is from $\frac{1}{61}$ to $\frac{1}{50}$ of an inch.

JOHN HOOD, F.R.M.S.

Dundee.

FURTHER NOTES ON THE TOOTHWORT (*LATHRÆA SQUAMARIA*).

EACH year, since 1883, when I first found *L. squamaria* in the locality indicated by G. E. Smith, in his "Plants of South Kent," published in 1829, I have visited the place, and on each occasion have found the plants all bearing the characters I described in SCIENCE-GOSSIP, January, 1884. In connection with my notes of that date, I would remark that it has been thought that Smith's plant was an old one, gone to seed, and that mine was a young, imperfectly developed plant. The editor's note, page 143, vol. xx. was in reference to specimens I sent him in full seed, and which were quite as crowded as the plant photographed by me. I have not yet found any plant in the least approaching that described and figured by Smith.

The plants I gathered in 1883 were growing in a section of the copse, which I will call for reference No. 1, and which had remained undisturbed for, I should say, from fifteen to eighteen years. There was but little undergrowth; the hazels, &c., being well up. In an adjoining section of the same copse (No. 2) of about two years' growth, I, together with several others, searched most assiduously for the plant, but without success. During the winter of that year, No. 1 section was cut down, and in 1884 there were

comparatively few specimens to be found, and none in No. 2 section. In 1885, I found but three specimens in No. 1 section, and again none in No. 2.

In 1886, I could not find a single plant in No. 1 section, although I paid several visits, and took with me several good searchers; but in No. 2 section I found two plants.

In 1887 I was still unable to find any plants in No. 1, while in No. 2, which is now about six years old, I found the plant in comparative abundance. Of course, during the first few years following the cutting down of a copse, the undergrowth is very considerable, and the difficulties of finding so small a plant as *L. squamaria* are great. But I feel convinced, from my experience, that its appearance is influenced (like that of some other woodland plants) by the condition of the copse with regard to its undergrowth.

That it has a most remarkable vitality, the following (communicated to me by G. B. Wollaston, Esq., of Chislehurst) will show. He informs me that he had a plant of *L. squamaria* in a flower-pot for about twenty years, during which time it never appeared above ground, but that at the end of the twenty years it was as sound and fresh as when first put into the pot. Its not appearing above ground was of course due to its want of food supply, it being parasitic.

Plants that have acquired the habit of parasitism—whether partial or complete—may naturally be expected to afford evidences of the time when they lived free and independent lives, in the retention or partial retention of organs or peculiarities of structure, which were absolutely necessary for them in their free and independent condition, but which are now of no further service to them, the host performing the function for the plant which its own structure enabled it then to perform for itself.

The animal world affords numberless instances of useless and aborted organs, evidently remnants of a previous condition of existence requiring a different organization; and in the vegetable world, no doubt, the instances will be found as numerous when the same amount of attention has been given to it. We already know of many modified leaves, aborted and imperfectly developed styles, &c. &c., and as our knowledge of the physiology of plant-life increases, it may reasonably be assumed that many remnants of a past condition will be discovered. That they will be so marked and diverse as in the animal world we should not expect; the functions and surroundings of the one being so many and various in comparison with those of the other.

L. squamaria affords us several remarkable and interesting features, illustrating "adaptation to environment" and the modification of organs to perform functions other than those primarily performed.

The peculiar fleshy scales of the plant under consideration I believe to be an excellent illustration of the retention of organs no longer of service to the plant for their original function, and of the modification of those organs, adapting them to the performance of a new and totally different one. If a transverse section be made of one of these scales, it will be found to possess several irregularly-shaped cavities (Fig. 6), and on the walls of these cavities will be found numerous little gland-like bodies.

These little bodies have been noticed by many observers; but what special function they perform has not (so far as I can learn) been hitherto discovered. In addition to these gland-like bodies, and scattered between them on the surface of the cavities will be seen numerous symmetrically arranged cells, reminding one of stomata. What function, however, could stomata possibly perform in this enclosed cavity? Certainly not the ordinary function of respiration. But that they are stomata, although perhaps useless and aborted, I think I have sufficient evidence to prove. Also that the little gland-like bodies are really glandular hairs, which, together with the stomata, occupied their usual position on the inferior side of the leaf of the plant before it acquired its parasitic habit.

How, why, and when *L. squamaria* took upon itself the habit of parasitism, are questions that can be answered by speculation only. That the habit was acquired gradually, we infer from observation—since changes in habit, and still more in structure, can take place but slowly.

Probably the first act towards parasitism was the developing of cells, which, coming into contact with some other growing vegetable substance, had the power of attaching themselves to it; and as *L. squamaria* is a succulent, rapidly-growing plant, it helped itself to the nutriment of its neighbour through these attached cells. This habit gradually grew until the plant became, as we now find it, wholly dependent for its existence on some strong and vigorous host.

Probably this proclivity to parasitism was brought about by the circumstances of its environment. What these were we cannot know; but that the habit became necessary to its existence we may be sure, and also that the cells possessing the function of attachment and absorption must be considered as a development or adaptation for this special function. As the habit of parasitism developed, the leaves and roots would gradually give up their own special functions, and, if suitably positioned, would adapt themselves to the new order of things; the plant either losing them entirely or partially, or modifying them to new functions. Thus the leaves of *L. squamaria* appear to have become modified.

An examination of the very young scales will reveal the fact, that they have apparently started life as ordinary leaves; instead, however, of developing a flat blade, as in an ordinary leaf, the young leaf takes a sharp bend downwards, and folds back upon itself, as in Fig. 7. The cells of the leaf

which come into contact, due to this folding back, are apparently possessed of the power of uniting, and thus forming the cavities seen in a longitudinal section. The formation of these cavities is due to the linear growth of the aborted leaf; the bending back of the leaf first takes place, as just remarked, when very young and small. Points, probably of the raised ribs near the apex, are brought into contact with other points near the base; attachment takes place, thus forming the first cavity; the leaf, by growth, increases in length, both between the points of attachment and the apex, and the same points and the base, which, after proceeding a certain distance, again come into contact and unite, forming a second cavity, and so on (Fig. 7). A transverse section reveals cavities that radiate from the stem. These are probably caused by the uniting of the underneath ribs of the leaf; for through each partition wall, between the cavities, may be traced the vascular bundles which ran through the ribs of the leaf in its earlier history, and which are continued through the base of the leaf into the stem, as seen in the transverse and longitudinal sections (Figs. 6 and 9).

The cavities in the scale are sometimes separate and distinct from each other, but more generally several, or even all, are united, forming one large cavity with deep recesses.

The apex of the leaf or scale, folded back upon the base, is never attached cell to cell, the tissue here never being continuous. It is, however, invariably pressed quite close; so close indeed, that in the cavity of a fully-developed scale I have never found any extraneous matter (I shall, however, refer to a younger scale later on). Fig. 9 is a fair example of the numerous scales I have examined. Hence, though these cavities are not hermetically sealed by cell-fusion, they may be considered practically air-tight, and may thus be correctly termed enclosed cavities, and, as such, they will render the stomata useless. It must not, however, be forgotten that the united cavities converge to the apex, which suggests that some time in the past they were in communication through an opening here, with the outer air; and also the probability of the stomata carrying on their function in a gradually lessening degree, until the opening was finally closed.

With regard to the method of development of the scales, I am at a loss to determine whether it is due to a folding back, and attachment taking place as described, or whether, after the folding back, caused by the cells of the ribs not being developed at the same speed as those of the lamina, has taken place, these former are (subsequently) developed with a speed equal to the growth of the lamina cells, and continuity is thus preserved. This appears to me to be a question presenting great difficulties, as it is highly probable that both methods obtain; the first in order being the method by attachment, gradually superseded by the continuous method, which latter may be replaced in course of time, if needed, by the production of the thick fleshy scale, without any break in the continuity of its tissue from the stem.

From these observations it will be seen that, whichever way the development of the scales may take place, it is such that the stomata and glandular hairs of a previous condition are enclosed in cavities, which may, in the course of development, altogether disappear, cell tissue taking their place.

If it be true, that the leaves of *L. squamaria* have become aborted as leaves, and developed into thick fleshy scales, it then follows that these scales must have a definite function to perform, for it does not appear feasible that such large and numerous appendages should be retained and developed without serving some purpose in the economy of the plant. The primary function of these scales I believe to be one of food-storage; the attachments of the plant to its host, as we shall presently see, while perhaps numerous, and in some cases very complete, do not seem sufficient to maintain the rapid growth of the thick succulent stem, the comparatively large flowers, and the production of the numerous seeds. The

Fig. 6.—Transverse section of a fully-developed scale, showing arrangement of cavities and vascular tissue. × 4.

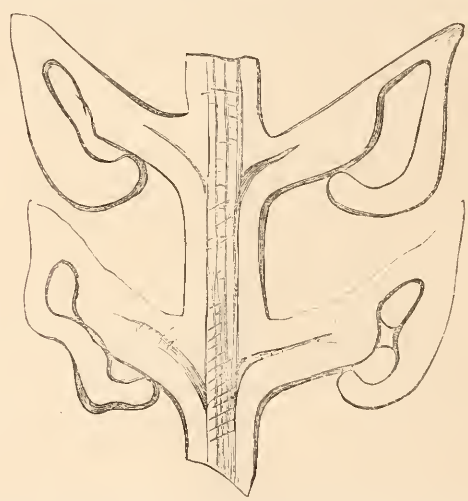

Fig. 7.—Longitudinal section of scale, illustrating the method of the folding back of the lamina, and the formation thereby of the longitudinal cavities. × 12.

period of the year in which *L. squamaria* blossoms (viz. April) is, of course, one in which great activity of growth is going on in the host, and food supply should be abundant. But, however complete the attachment may be to the host, there must be some limit to the speed at which food materials can be supplied, especially when it is considered that at this time the host is needing all its resources on its own account. It certainly would be strange if, during the seven months' activity of the host, a period of only five or six weeks was utilised by the parasite. The most natural act (if I may so describe such an unnatural proceeding) would appear to be, that the parasite took advantage of the whole time of the host's activity, during which, when not appearing above ground, it was storing up material in its scales for its next flowering. In August, 1886, I dug up a plant (previously marked) on which the scales were about half-grown, and with the flower-spikes about half an inch long. (Shown exact size in Fig. 10.) This points to conditions such as obtain in the Orobanches, which remain under ground for several years, occupying the time in storing up food-material in the large scaly bulbous base of the stem; so in all probability does *L. squamaria* store up in these fleshy scales the necessary supplies for the period of flowering.

The cellular tissue of fully developed scales is

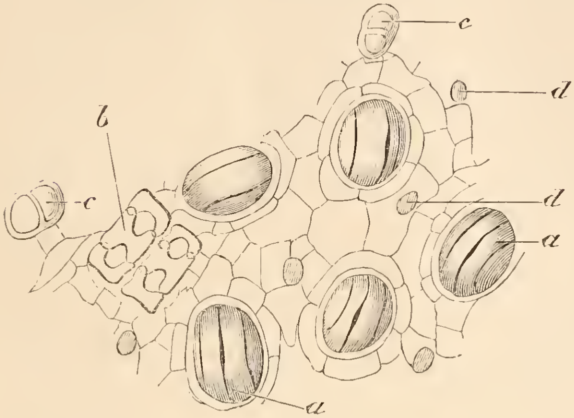

Fig. 8.—Stomata and glandular hairs in cavity of scale. (*a*) stomata; (*b*) a stoma, with guard cells removed; (*c*) glandular hairs; (*d*) stem cells of glandular hairs. × 220.

Fig. 11.—Cavity of young scale with spores and mycelium of a fungus enclosed. × 50.

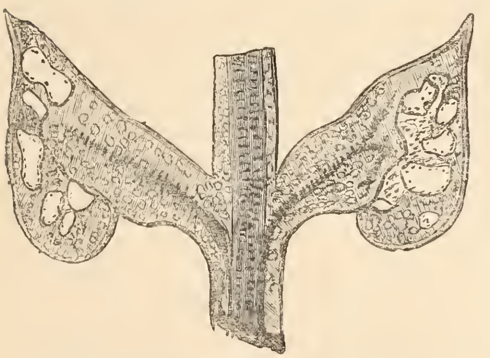

Fig. 9.—Longitudinal section of fully-developed scales, showing the connection of the small cavities with one another, also the unattached apex. × 4.

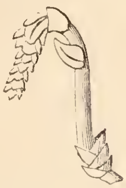

Fig. 10.—Flower spike, as found in August, 1886.

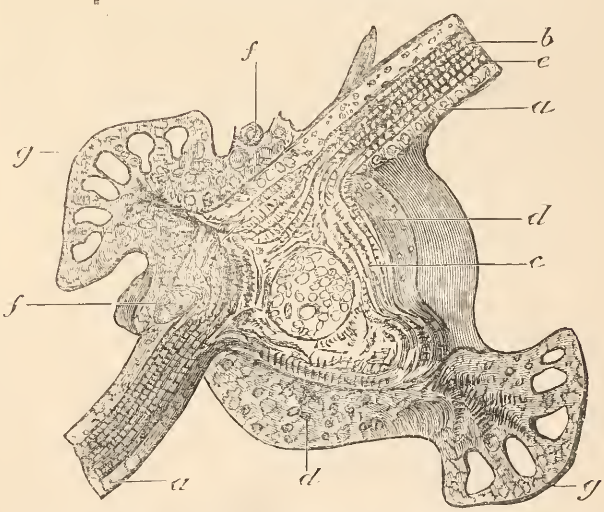

Fig. 12.—Transverse section of underground stem near the base, showing attachments to the host (hazel). (*a*) Hazel root; (*b*) vascular tissue of host; (*c*) vascular tissue of parasite; (*d*) parenchyma of parasite; (*e*) parenchyma of host; (*f*) two small rootlets of the hosts attached; (*g*) sections of young scales. × 7.

crowded with starch granules; and, after flowering, many of the scales may be found in a half-decomposed state, quite black and exhausted.

In addition to this function of food-storage, I am inclined to think (but of this I have at present but little evidence), that the epidermal cells of the scales have the power of attaching themselves to any suitable root with which they may come into contact. But although I have searched very diligently, and washed very carefully, I have not yet succeeded in securing any example showing such attachment.

In the first place, the attachment, if any, is but very slight, and in the next, the soil in which I find the plant is very clayey and difficult to remove; but, from several specimens I possess, exhibiting an altered or abnormal condition of some few of the epidermal cells, I am strongly of opinion that they possess this power.

This leads me to the consideration of the mode in which *L. squamaria* attaches itself to its host. Dr. Trimen, in his very interesting article on "Parasitism of Flowering Plants," in the "Popular Science Review," July, 1873, mentions, ". . . *thick tooth-like scales*, from the axils of some of which slender rootlets are given off. The observations of Mr. Bowman, in 1829, first showed that upon these rootlets were borne the absorbent tubercules. Carefully washing away the soil will show these attached to the rootlets of the supporting plant, and a section through both displays a perforating cone penetrating the bark at least, and, as I am informed by Mr. Stratton, actually pushing its way into the very wood."

Without questioning the accuracy of these observations, I must confess that I have been unable, so far, to discover any such rootlets. I have found many rootlets of the host and of other plants—growing near—interwoven, as it were, between the scales and stem; and when it is considered that the soil in which the plant grows is invariably dense with these rootlets, it is not surprising that they should be found so interwoven.

The only attachment that I have been able to discover and fix with certainty, is that which the parasite makes to its host, at and near the extremity of its underground stem. Here it seizes upon, and absorbs into itself, the rootlets of its host, the union usually being so complete that it cannot be determined where the one begins or the other leaves off. Not only the parenchyma, but the vascular tissues also unite, so that the one is continuous with the other. Near the end of the stem the number of host-rootlets absorbed is sometimes very great, a thin transverse section frequently showing four or five attachments; the rootlets seized are sometimes very large.

It is beyond these attached rootlets that the branching of the underground stem takes place. I have found as many as fourteen branches upon one such stem; and on none of these have I been able to discover any other attachment, with the exception of the doubtful one mentioned in connection with the scales. If, then, this is the only attachment, weight is added to my conclusion that the function of the scales is that of food-storage.

In a previous paragraph I have mentioned the fact of not having found any extraneous matter in the cavities of fully-developed scales. In several young ones (gathered in 1885 and 1886), I have, however, found the mycelium of a fungus in great abundance, and have been fortunate in getting sections showing the spores of this fungus developing. As these spores are a considerable size (too large to get in after the closing of the cavity), I am of opinion that they are enclosed by the folding back of the leaf. Fig. 11 represents a cavity with spores and mycelium enclosed.

I am not acquainted with *L. clandestina*, the other European species, or with any other foreign ones; but it would be interesting to know whether they resemble *L. squamaria* in the several characteristics mentioned, or whether the modification of the scales, if any, is at a different stage.

With regard to the allied genus Orobanche—*O. picris*, *O. caryophyllaceæ*, *O. major*, and *O. minor*—the only species of which I have any knowledge—the method of attachment is very similar, the tissues of host and parasite so coalescing that it is very difficult to trace the connection.

In Cuscuta the haustoria are distinct cells, penetrating the tissues of the host. So in Pedicularis, Rhinanthus, and Melampyrum; but in these the attachment is very slight indeed, and quite different from that which obtains in the Orobanchaceæ.

W. T. HAYDON.

Dover.

RUDIMENTS AND VESTIGES.

IN an article which appeared in the October issue of SCIENCE-GOSSIP, I remarked that, "In the sense in which the term Rudimentary is repeatedly to be found in 'The Descent of Man' (i.e. to express the supposed 'vestiges of structures existing in early types'), it is a contradiction to the theory of evolution."

Your correspondent, Mr. F. G. Fenn, defends Mr. Darwin's use of it, and confidently asserts that there is a "double meaning" for "the word." He gives two explanations, the exact opposite of one another; the first expressing, "vestiges of structures existing in early types"—i.e. something left behind from a once fully developed organ, at the very end of its existence; and the second expressing "the foreshadowings or beginnings of structures in process of devolopment."

How these two contrary meanings can be given to the same word requires explanation.

That Mr. Darwin employed the term in the former

sense is evident, as "vestige" and "rudiment" are used by him interchangeably, and his own explanation of the word "rudimentary" is as follows. He says, "In order to understand the existence of rudimentary organs, we have only to suppose that a former progenitor possessed the parts in question in a perfect state, and that under changed habits of life they became greatly reduced." But he especially contradicts the latter meaning attributed to him by Mr. Fenn.

Far from stating that rudimentary organs are "beginnings of structures in process of development," Mr. Darwin explains that they "are either absolutely useless," or "tending in this direction," and that they must be distinguished from "nascent organs," which, he says, "on the other hand, though not fully developed, &c., are capable of further development."

From this it is plain that in the one sense only does Mr. Darwin allow that the word is used by him; and to show the confusion of ideas that the retention of the terms in this sense is bound to involve, was the object of my paper.

Mr. Fenn's statement that "many able anatomists and naturalists would now use 'vestiges' in the place of 'rudimentary,'" only tends to suggest a doubt of its correct application. Why should vestigial be substituted, unless rudimentary appeared unsuitable? And we have only to refer to its derivation, and to the authority of numerous writers, to perceive at once that it is eminently unsuitable. Dryden, Addison, Bacon—all used the word rudimentary in its true sense of "first, inaccurate, unshapen, beginning or original of anything."

With Shakspeare, Locke, Milton, and others, it also meant "first principles and first elements"; and many authors of repute might be quoted to confirm this as the rightful use of the word. Only, I believe, among modern scientists would the strange perversion of the word be found.

Mr. Fenn is of opinion that I have read Mr. Darwin's works with a "preconceived idea" of their teaching; but I am bound to acknowledge that if I had any bias at all, it was strongly in favour of the honest, painstaking scientist; and if Mr. Darwin, by his persistent accuracy, has taught his readers to submit terms as well as facts to a strict investigation, he would have been the last to complain of the jealous regard for truth which cannot sanction the misuse of a single word, even were that word misapplied by himself.

To Mr. Fenn's question, "Why should we claim perfection for ourselves, and deny it to all other organisms?" I reply, that, arguing upon evolution grounds, we are bound to look upon anything lower than the ideal form as an arrested development; and, for the sake of the argument, I adopted that position.

The subject being a very wide one, and requiring more room than may be claimed for mere correspondence, I should be glad at any future time to answer the query in full in an article, could space be afforded me to do so.

I cannot quite reconcile Mr. Fenn's question with the two following statements in his paper. He says, "Perfect as all our organs are at the present, we have no reason for supposing that evolution has reached a limit," &c. Are all our organs perfect at the present time? Then why does your correspondent object that "Miss Layard would take man as perfection"? It seems that we are agreed in this particular. But the next sentence is perplexing. Mr. Fenn continues, "Of all our organs which we have handed down to us, &c., som have been developed, &c.; others, falling into disuse, have become partially degenerate." Here are two statements hard to reconcile.

"All our organs," we are told, are "perfect at the present time," but some of our organs "have become partially degenerate"! As it is impossible here to enter at any length into the vast subject of evolution, I would return to the special point at issue—namely, the advisability of retaining or rejecting the word "rudimentary" in the sense in which it is used by Mr. Darwin.

Unless a better excuse can be made for its retention, it would still appear to be misleading and incorrect.

NINA F. LAYARD.

ASTRONOMY AND METEOROLOGY.

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

THE observations made at the Royal Observatory of the Collegio Romano during April, May, and June, give particulars of the distributions of the solar spots, faculæ, and protuberances, and a table of the numbers and comparative extent of the spots and faculæ observed from July to September. A great diminution took place in both spots and faculæ towards the end of August, and in the intervals between the 23rd of August and the 2nd of September, and the 5th to the 12th of September, no spots or faculæ were seen.

At the meeting of the Royal Astronomical Society, held on the 11th of November, a letter from Mr. Roberts was read, in which he offered to place at the disposal of Fellows of the Society photographic negatives of stellar groups which will enable them, by using a proper microscope and micrometer, to obtain, by measurement, results that may be useful to astronomy.

Professor Pritchard read a paper on Further Researches in Stellar Parallax by Photographic Methods.

Mr. Creswick exhibited some photographs of star-groups which had been taken at Greenwich with the Sheepshanks Equatorial on curved plates, to determine the extent of the field that would be made use of for purposes of measurement. The result

obtained was that for purposes of accurate measurement, a field of 4 deg. might be used, and a field of 5 deg. where only approximately accurate results are required.

On January 28th, there will be visible a total eclipse of the moon, beginning at 9.30 P.M.

Meteorology.—At the Royal Observatory, Greenwich, the highest reading of the barometer for the week ending 19th November, was 30·22 in. on Wednesday morning, and the lowest 29·11 in. on Saturday morning. The mean temperature of the air was 34·1 deg., and 7·6 deg. below the average. The general direction of the wind was east and north-east. Rain fell on two days of the week, to the aggregate amount of 0·53 of an inch. The duration of registered bright sunshine in the week was 11·0 hours, against 13·7 hours at Glynde-place, Lewes.

For the week ending 26th November, the lowest reading of the barometer was 29·17 in. at the beginning of the week, and the highest 29·84 in. on Wednesday evening. The mean temperature of the air was 38·7 deg., and 2·3 deg. below the average. The general direction of the wind was north-east. Rain fell on four days of the week, to the aggregate amount of 0·31 of an inch. The duration of registered bright sunshine in the week was 0·2 of an hour, against 2·7 hours at Glynde-place, Lewes.

For the week ending 3rd December, the lowest reading of the barometer was 29·47 in. on Tuesday morning, and the highest 30·31 in. on Friday morning. The mean temperature of the air was 43·3 deg., and 1·9 deg. above the average. The general direction of the wind was south-west. Rain fell on three days of the week, to the aggregate amount of 0·48 of an inch. The duration of registered sunshine was 7·4 hours, against 11·1 hours at Glynde-place, Lewes.

For the week ending 10th December, the highest reading of the barometer was 29·86 in. at the beginning of the week, and the lowest 29·13 in. on Thursday evening. The mean temperature of the air was 40·4 deg. and 2·2 deg. below the average. The general direction of the wind was westerly. Rain fell on four days of the week, to the aggregate amount of 0·47 of an inch. The duration of registered bright sunshine in the week was 2·9 hours, against 9·1 hours at Glynde Place, Lewes.

January is the coldest month in the year. The mean temperature at the Land's End is 45 deg., while in the plain of York it is only 38 deg., the difference being due to the influence of the Atlantic. Travelling from south-east to north-west, the mean temperature of some of the principal towns is approximately as follows:—Truro, 44 deg.; Plymouth, 43 deg.; Exeter, 42 deg.; Dorchester, 41 deg.; Portsmouth, 40 deg.; and London, 39 deg.

The average rainfall in January is 5 inches from the Land's End nearly to Exeter; 4 inches in Devon and Dorset; 3 inches along the South Coast and through the greater part of the south of England, from Bristol to Canterbury; 2 inches through Cheshire and the Midlands to the Essex coast; and only 1 inch along the East coast from Newcastle to Ipswich.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

BUYS-BALLOT.—On the 16th of November last, the University of Utrecht worthily instituted a festival in honour of the fortieth anniversary of the "doyen des météorologistes," M. Buys-Ballot, at the same time founding a prize of a gold medal to be given every ten years for memorable work in meteorology, the first, of course, being then given to the venerable professor.

This is not the place for a sketch of Buys-Ballot's life-work, and if it were, it should be drawn by some one knowing more of the subject than I do. But there is one simple and important generalisation to which his name is attached that should be better known than it is among us here. I allude to "Buys-Ballot's law" concerning the winds and barometric gradient. This gradient has more to do with weather prediction than the height of the barometer at any particular place. If the barometer be either high or low or medium at such place, and of nearly the same height at other places all around, immediate change may be expected; but if that place be in a steep barometric gradient, i.e. if the barometer is much higher or lower at other places beyond it, a change is imminent.

If the barometer at a given time stands one-tenth of an inch higher at Edinburgh than at London (both corrected to sea-level), there is a moderate gradient; with a difference of half an inch there is a steep gradient, indicating unsettled and stormy weather. These gradients may be easily traced on the weather charts published by some of the newspapers. The curved lines, usually dotted, are *isobars*, or lines of equal pressure, against which are marked the height of barometer all along that line; the direction of the wind is marked by arrows.

Buys-Ballot's law, in the northern hemisphere, is that, if you stand with your right hand towards the region of higher barometer, and your left hand towards lower barometer, the wind will blow against your back; or *vice versâ*, if you stand with your back to the wind, the barometer gradient is ascending on your right and descending on your left, or the opposite if you face the wind. You may test this law by taking such imaginary positions on one of the weather charts, and observing the relations of the arrows and isobars to yourself.

THE AFRICAN-MEDITERRANEAN PROJECT.—Among the grand projects of M. de Lesseps was one for cutting a canal from the Mediterranean on the coast of the Gulf of Gabes, in order to flood that neighbouring part of the desert, a large area of which is supposed to be below the sea-level. There appears to be a hitch somewhere; either the depression proves, on further survey, to be much less than was originally supposed, or there are difficulties in the cutting, which was at first described as very easy. The project, however, is not to be abandoned. Commandant Landas, who is there apparently as the agent or representative of M. de Lesseps, has ascertained the existence of underground waters in the region in question, and is at work sinking wells, one of which yields 1800 gallons per minute, another 2000 gallons per minute. These wells are sunk for the purpose of fertilising the district, and thus affording support to the labourers who are to work upon the canal which is to supply the projected inland sea.

CARBONIC ACID IN SCHOOL-ROOMS. — Experiments have been recently made by W. Fossek on the quantity of carbonic acid in an unventilated school-room before and after the meeting of the class. In three determinations made before the pupils entered, he found the air to contain respectively 0·078, 0·092, and 0·088 per cent. by volume. After three hours' occupation by the class of fifty-eight scholars, it contained 0·620, 0·637, and 0·557 per cent., or between seven and eight times as much. Besides this there are the bodily exhalations, which are still worse than the carbonic acid. The practical lesson taught by these facts is, that wherever school accommodation is at all limited, the pupils should clear out for a run between each lesson.

BASIC CINDER AS MANURE.—Further study of the manurial efficiency of the cinder obtained by applying the Thomas-Gilchrist, or basic process, in Bessemer steel-making from very bad pig-iron, brings out higher estimates of its value. Many such investigations have been made on the Continent during some years past, and quite recently Aitken has published his results in the "Transactions of the Highland and Agricultural Society" for 1887, p. 245. He compared basic cinder containing 40 per cent. of phosphate of lime with Curaçoa phosphate containing 87 per cent., Canadian phosphate, 59 per cent., and Carolina phosphate, 57 per cent.; and found that when applied to the soil under corresponding conditions, it was about as effective as the above-named phosphates. He attributes this superiority, in proportion to its constituent phosphorus, to its finely-ground condition as supplied in the market; but Dr. J. M. H. Munro ascribes it to the great relative solubility of the phosphate of lime contained in it. There is but little difference between these explanations, so far as practical application is concerned. The important fact is that the basic process brings forth a vast quantity of buried phosphates that may be laid upon the surface to increase the food supplies of the world, and that it does this at a smaller expense than such phosphates are otherwise obtainable.

MANURE FROM GRANITE.—Intimately connected with the above in its economic bearings is the use of felspar as a manure. It contains potash, one of the absolutely indispensable constituents of fertile soil, and that particular one which is the most liable to be wastefully washed away, owing to the free solubility of the nitrates, chlorides, sulphates, and carbonates of this alkali. But the silicate that exists in the felspar is the one exceptional salt of potash that is not freely soluble. It is slowly decomposed in the presence of water and carbonic acid, and is thus gradually supplied to the plant-roots as they require it. If, however, the felspar were added to the soil in lumps like the natural crystals, the process of solution would, on the other hand, be too slow; but by grinding it to a certain degree of fineness the just medium is attainable.

Mr. Aitken describes, in the "Transactions of the Highland Agricultural Society," some experiments made at Pumphuston on turnips, and at Boon on peas, with felspar ground sufficiently fine to pass through a sieve of 120 meshes to the linear inch. On the turnips the felspar did better than an equivalent quantity of sulphate of potash, on the peas not so well.

Seeing that we have mountains of granite and porphyry largely composed of felspar, and these in sterile regions, the fact that we can produce valuable manure by simply crushing the boulders and other rock fragments that cumber the ground, and adding to the powder some phosphates of lime, such as the waste cinder of ironworks above described, opens a wide field for agricultural enterprise. We hear much about the emigration of the London "unemployed." They need not be transported across the Atlantic, nor to the Antipodes; there is work enough for them in the reclamation of Dartmoor and the granitic wastes of Cornwall, and they would do the work well and cheerfully under arrangements that would ultimately render them the owners of the land they had rendered fertile.

THE RABBIT PLAGUE IN AUSTRALASIA.—The magnitude of this scourge is not yet sufficiently appreciated in our hemisphere. It it remains unchecked, it practically amounts to the ruin of the otherwise most hopeful region of the world. But there is now some hope. Pasteur has come to the rescue, and science is to be applied. Most of my readers will have learned how, ere this will be published. Chicken-cholera broth is to be sprinkled on tempting herbage, the rabbits are to eat this, and,

having done so, they are to propagate an infection that will wholly or partially exterminate them. "A consummation most devoutly to be wished for!"

So far the project is most promising, but the danger to the poultry and game of the country is rather serious. Pasteur answers for the sheep. He has tried, and finds that they are not liable to this particular infection.

Among the birds of New Zealand is one vile luxurious beast whose extirpation is most earnestly demanded. It is that epicurean parrot, that feathered gourmet, which has discovered in the kidney suet of the living sheep a food more dainty than the vegetable oil of its natural seed-food. The hateful bird accordingly fixes its claws in the wool of its victim, and tears away its skin with cruel beak; then dives amidst the warm blood and quivering flesh into the fat surrounding the kidneys, while the tortured sheep struggles in vain to shake off its tormentor, and dies after suffering the most dreadful agonies that are possible to such an animal.

If Pasteur's remedy fails, there is another direction open for research. May we not find some herb that will poison rabbits? If so, it could easily be planted in small patches, carefully enclosed with wooden stakes at about six inches apart, too close for sheep or lambs to pass, but free to rabbits. In dry weather they will eagerly devour almost anything that is succulent, and these little plantations might be watered, if necessary, during Australian droughts.

Wolves in France.—It is a curious fact that, while Pasteur is coming forward to rescue the Australians from their four-footed pest, the ancient and classical quadruped scourge of France is increasing so seriously that, only five years ago, the French Government found it necessary to raise the head-money on wolves. They now offer 200 francs for killing a wolf that has attacked human beings, 150 francs for one in young, 100 francs for a male wolf, and 40 francs for a cub.

In 1882, 423 wolves were killed; in 1883, 1316; in 1884, 1035; in 1885, 900; and in 1886, 760.

When living in Flintshire, I paid a rate of two-pence per acre as mole-catchers' tax, the result being that at certain times a mysterious personage groped mysteriously in the fields; and on the following morning two or three black objects were seen hanging to wires. These were moles, and the wires were parts of traps which were supposed to have caught the moles. Libellous persons asserted that the same moles were exhibited again and again in different fields, and that the mole-catcher was a mole-preserver, as extermination of the moles would ruin his trade. With such high awards for the killing of French wolves, the like may occur in France, if wolf-catching is a profession. A pair of wolves and family might be carefully fed until the cubs reached the 100 francs or 200 francs stage of life, and the enterprise would probably yield a good profit to the peasant on whose land they were reared, and who, knowing their habits, would gather his wolf harvest at the proper season.

SCIENCE-GOSSIP.

A capital new illustrated monthly has been brought out in the United States, under the editorship of Dr. Manton and others, entitled "The Microscope." The London agent for it is Mr. W. P. Collins, 157 Great Portland Street, W.

We have received a copy of Mr. J. G. Goodchild's elaborate paper on "Ice-work in Edenside, and some of the adjoining parts of North-Western England," reprinted from the Transactions of the Cumberland and Westmoreland Association.

In last month's number of "The Welcome" is a lengthy, well-written, and elaborately-illustrated article, by Mr. H. M. J. Underhill on "The Beautiful Floscule."

The account of the Microscopical and Natural History Soiree of the Croydon Club, on Nov. 19th, reached us too late for notice in our last. It appears to have been highly successful, in spite of a foggy night. The list of objects of science was enormous.

The Ipswich Scientific Society held their three years' Conversazione in the Public Hall, on Nov. 29th; about 800 people were present. The hall was lit by electricity conveyed by wires over the house-tops from the office of the "East Anglian Daily Times," more than a quarter of a mile away, and the same electric energy was also utilised to work the machinery.

A new book by Dr. J. E. Taylor, editor of Science-Gossip, is announced under the title of "The Playtime Naturalist." It is to be copiously illustrated.

The Swiss "Journal of Ornithology" announces the extinction of the last Alpine Vulture or Lämmergeyer. The last specimen believed to be remaining is now in the Museum at Lausanne.

Mr. Norman Lockyer's articles on Meteorites, now weekly appearing in "Nature," have attracted much attention, as being original contributions to the theories of Cosmogony.

A keen controversy has been going on in the same journal between the Duke of Argyll and Professor Bonney, relative to Darwin's theory of the "Origin of Coral Reefs."

The district Calabria was again visited by a terrible earthquake on December 1st.

The National Association for the Promotion of Technical Education, recently held a most successful meeting in Manchester, at which Sir Henry Roscoe,

Professor Huxley and others made powerful speeches. The association is about to extend its sphere of agitation to Liverpool, Glasgow, Newcastle, and other large towns.

MR. GOSCHEN'S Presidential Address to the Statistical Society on December 6th, obtained much public attention. His statistical inferences are most valuable at the present time.

THE HOWIETOUN FISHERY records the successful exportation of salmon ova to New Zealand, viz.: One hundred and thirty-five thousand in the S.S. Kaikoura, three hundred and sixteen thousand in the S.S. Doric, and one hundred and twenty-five thousand in the S.S. Tongariro, making five hundred and seventy-six thousand salmon ova, which were obtained from the Forth, Tay, and Tweed Districts. The whole of the consignments arrived in good condition. The American land-locked salmon (*S. sebago*) and the rainbow trout (*S. irideus*) have done well during the past season, but did not spawn last spring. It is hoped, however, they will do so next. The cross between *S. levenensis* and *S. salar* ♂ proved fertile last winter and has been re-crossed with levenensis—thus: *S. levenensis* has been crossed by (*S. levenensis* × *S. salar* ♂) ♂, and produced the largest fry at present in the Fishery; and (*S. levenensis* × *S. salar* parr ♂) has been crossed by *S. levenensis* ♂, the produce being fair fry. Thus it now appears probable that trout may be improved in size by the introduction of salmon blood without sacrificing fertility.

A "FLORA OF Hertfordshire" is announced. It is by the late A. R. Pryor, and will be edited for the Hertfordshire Nat. Hist. Society, by Mr. B. D. Jackson, Secretary of the Linnean Society, with an Introduction on the geology, climate, botanical history, &c., of the county, by Mr. John Hopkinson, F.G.S., and the editor.

MICROSCOPY.

NOBERT'S BANDS.—I have a slide of Nobert's bands, and I find it is ruled to fifteen bands. Can any reader tell me the distance between the lines of the fifteen band slides?—*Micro.*

ENOCK'S SLIDES.—We have received sketch 17 of Mr. Enock's famous Entomological Studies. It is the only authentic drawing of the notable Hessian Fly, from exact measurement. Accompanying it is sketch 18 of the "Fairy Fly" (*Camptoptera papaveris*), an exquisite object under the microscope.

ANOTHER EVENING AT THE ROYAL MICROSCOPICAL SOCIETY.—The "Scientific Evening" of the Royal Microscopical Society, held on the 23rd November, in the Library of King's College, was a great success. The most important exhibit was the display, by Dr. Crookshank, of a series of microphotographs of many kinds of Bacteria. These were shown in the Doctor's Laboratory, by means of the Oxyhydrogen lantern. Dr. Crookshank was very successful in his demonstration, which had a two-fold object. Firstly, to show how capable photography is, to depict these delicate organisms; and the value such results possess, in the facility for demonstrating their portraits to numerous students in a class, with absolute fidelity; and, secondly, to show, that, although many persons believe the various Bacteriological forms to be all alike, more or less; yet, the fact is, when sufficiently high magnification is employed, as in the case of these photographs: it is clearly seen that each bacteriological form is quite specifically distinct; and no two forms seem to be quite alike. The various species seem to possess almost as much individuality of character as the various seeds of plants, when placed under the microscope. The lecture, and the examination of the objects and apparatus, in the Doctor's laboratory, proved most instructive and interesting. In the library a great number of most interesting displays were made. Mr. Michael, the much-loved President of the Quekett Club, exhibited a rare species of Phalangium. The cyclosis in vallisneria was well shown by Mr. Ingpen, under an Apochromatic quarter-inch objective. Messrs. Beck had a good display. Powell and Lealand's exhibit, as usual, was superb. In one microscope they were giving results upon *Amphipleura pellucida*, with the analyser of the Polariscope placed over the eye-piece. There was a collection of Polyzoa shown by Mr. Hardy: Mr. Hailes was showing objects, chiefly Foraminifera, under a Stephenson's binocular. Mr. Dadswell was showing the cyclosis in a bulblet of Chara (a marvellous sight, one I had never before seen): also, some splendid specimens of "Pond Life," notably a very large *Amœba princeps*, of unusual activity. Mr. E. T. Browne made quite a sensation with an abundant collection of his new find, *Orthesia insignis*, of all sizes and ages, alive in a cork cell under a four-inch object-glass. These insects were the admiration of everybody. To most persons present, they were the greatest novelty in the room. Then there was an exhibition by another gentleman of a living house-fly, regaling itself with sugar. Mr. Rousselet had a fine *Floscularia ornata*. Messrs. Watson had some remarkably beautiful slides of insects' eggs, diatoms, &c. Mr. Freeman showed a collection of consecutive sections of insects, prepared by Mr. Underhill, whose skill in this direction is wonderful. Mr. Fitch had a lot of clever dissections of spiders. Mr. Nelson was showing *Amphipleura pellucida* in the manner in which he only can. Mr. Enock exhibited the Hessian Fly, and a lot of his clever sketches of many minute Hymenopterous insects. Baker's table, as usual, had a fine display. The new apochromatic lenses, and what they can be made to show, were well illustrated. The well-known podura scale was splendidly shown.

There was also some new apparatus by Zeiss. Mr. Badcock exhibited "Pond Life," some rare finds. Our old friend, the larva of *Tiresias serra*—memorable for the settlement, many years ago, of the question, "Whence is obtained the object, figured in all the microscopical works as 'Hair of Dermestes'" (vide SCIENCE-GOSSIP, October 1865, and the early discussions reported in the journal of the Quekett Club), —put in an appearance, to remind one of old errors cleared away; for the object, so well known, is not got from Dermestes at all. Mr. Groves displayed the structure of a glandular hair of Drosera, an insect-eating plant; and Mr. Grove illustrated the recent botanical discoveries as regards the continuity of protoplasm in the medullary rays of certain plants. The beautiful microscopic drawings made by the late Mr. Draper were on view. The readers of SCIENCE-GOSSIP have seen a few of these, associated with the chapters on "Graphic Microscopy," which appeared two or three years ago; and from these specimens, will be able to judge of the quality of the whole collection, which will probably become the property of the Royal Microscopical Society. The genial Mr. Charters White was in good form, with his capital album of microphotographs. That man is always "to the front;" and so is Professor Stewart, who showed a very pretty object from a Crustacean, never seen before. He told me it had no scientific interest, though I and others found it to be very, very curious. There were several interesting mineralogical slides, and many other exhibits worthy of special notice. Many old friends turned up; and there were many joyful recognitions of old microscopists whom we have not seen for years. On a former occasion (SCIENCE-GOSSIP, 1875, page 16), I thought it worth while to record a most interesting Scientific Evening on 9th December, 1874; and this latter display is equal to it. It shows that the old society is as vigorous as ever, although so many of its then energetic Fellows have "joined the majority."—*S. J. McIntire.*

ZOOLOGY.

HYALINA GLABRA, VAR. BICOLOR.—This variety is mentioned in the "Journal of Conchology," 1886, p. 86, but has never been described. It differs from the type in having a whitish or pale umbilical region, which is more or less sharply defined from the brown colour of the rest of the shell. The interest of this form, which was taken at Bromley, Kent, lies in its being apparently a case of atavism. According to the theory that the brown colour represents the dark bands of other Helicidæ suffused over the shell, this variety bicolor is a case in which the suffusion has not taken place lower than the edge of the fourth band, leaving the original ground-colour in the umbilical region. It may be well to state that the *H. glabra* is *Zonites glaber* of Jeffreys, and the *H. alliaria* of some Continental authors, though not of Kobelt.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

H. ARBUSTORUM, M. SINISTRORSUM.—In the last number of the "Journal of Conchology" (Q. J. C., s. 225), Mr. J. W. Taylor records the only two sinistral specimens of *Helix arbustorum*, L., which he knows. A third specimen was recorded in the May-June number of the "Nachrichtsblatt d. d. Mal. Ges.," for this year (p. 76), by Herr Tschapeck. He found it in Styria, near Mittendorf, in the meadows of the Salza. The specimen was perfect and mature, with a curiously-depressed spire, colouring not mentioned. The specimen figured in Férussac belonged to M. Charpentier, and was found near Gryon, in Canton Vaud.—*Brockton Tomlin, B.A.*

SCARCITY OF V. ATALANTA IN 1887.—I wonder if Lepidopterists in general have noticed a scarcity of *V. atalanta* during the past season? Though I have been in the country all the summer and autumn, and have been constantly in the open air, generally for five or six hours every day, I have only met with a single individual of this species. I can hardly think that this was owing to any want of observation on my part, especially as I could only find two caterpillars, though I must have searched several hundred nettle-beds for them. Last year I got fourteen caterpillars without making any careful search for them, and in due course I saw several dozens of the perfect insect. —*R. B. P., Eastbourne.*

THE ZOOLOGICAL SOCIETY OF GLASGOW.—The third meeting of this society for the session was held on Monday, 14th November, the Rev. E. Walters, president, in the chair. One new member was elected. Mr. J. MacNaught Campbell showed a black racer (*Coluber alleghaniensis*, Hol.), and a blue racer snake (*C. constrictor*), from North America, both exceeding five feet in length. The same gentleman exhibited several garter snakes (*Tropidonotus saurita*, Linn.), and a small rattlesnake (*Crotalophorus tergeminus*, Hol.), which, although only a few inches in length, was quite capable of defending itself. Mr. G. G. McKenzie exhibited several diving spiders (*Argyroneta aquatica*) with their nests from his aquaria. The secretary showed skins of an old female and young male "Old English" black rat (*Mus rattus*, Linn.), caught recently in Glasgow. This species—which is now almost extinct in Britain —is hardly ever found now in this district, having given way before its larger and more powerful relative, the common brown rat.—*W. Hannan Watson.*

COLOURS OF COCOON SILK.—At a recent meeting of the Entomological Society, Mr. E. B. Poulton exhibited the cocoons of three species of Lepidoptera,

in which the colour of the silk had been controlled by the use of appropriate colours in the larval environment at the time of spinning up. He said this colour-susceptibilty had been previously proved by him in 1886, in the case of *Saturnia carpini*, and the experiments on the subject has been described in the Proc. Royal Society, 1887. It appeared from these experiments that the cocoons were dark brown when the larvæ had been placed in a black bag; white when they had been freely exposed to light, with white surfaces in the immediate neighbourhood. Mr. Poulton stated that other species subjected to experiments during the past season, afforded confirmatory results. Thus the larvæ of *Eriogaster lacustris* had been exposed to white surroundings by the Rev. W. J. H. Newman, and cream-coloured cocoons were produced in all cases, whilst two or three hundred larvæ from the same company shun the ordinary dark brown cocoons among the leaves of the food-plant. In the latter case, the green surroundings appeared to act as a stimulus to the production of a colour which corresponded with that which the leaves would subsequently assume. Mr. Stainton suggested that larvæ should be placed in green boxes, with the view of ascertaining whether the cocoons would be green. It had been suggested that the cocoons formed amongst leaves became brown because the larvæ knew what colour the leaves would ultimately become.

BOTANY.

Tree-growing after Girdling.—In May, 1879, I attempted to kill by girdling a tremulous poplar-tree, which, by its position and the numerous suckers it threw up from its wide-extending roots, interfered with my orchard. I cut off a strip of bark twelve inches wide entirely around the tree, at a spot about a foot from the surface of the earth. The part left bare seasoned over that year, but the tree did not die; however, it shed its leaves earlier than others of the same species. It grew on the next year, as if nothing were the matter till the autumn, when the foliage assumed unusually brilliant colours of red and yellow a full month before there was any change on the other trees. It continued growing during the third year subsequent to the girdling, but with diminished energy, and the leaves changed their hue at the close of summer, and fell very early in autumn; and next spring, 1881, the tree was quite dead. I should mention that it did not put out its leaves just so early in the spring after being girdled, as it would otherwise have done. I have read in the "Scientific American" of a somewhat similar experiment, with the difference, however, that the Vermont tree kept growing on above the ring, and increased in three years five inches in circumference above, while it remained of the same girth below. There was no such exceptional phenomenon in the tree with which I dealt in co. Armagh.—*H. W. Lett, M.A.*

Flowers and Fruits.—At pp. 11 and 12 of Dr. Taylor's most interesting and suggestive "Sagacity and Morality of Plants," I find, "A leaf is a much more highly-organised vegetable production than a petal. . . . Flowers are frequently terminal . . . borne . . . where the uprising sap . . . must be poorest and thinnest." This, of course, I quite understand. On pp. 14 and 15 there are descriptions of flowers of the gentians, etc., being produced "at great physiological expense" to the plant; added to this, of course, it is well known that plants expend a great deal of energy on the all-important process of ripening their seeds." I should be glad if any one will explain how fruits obtain the amount of nourishment they require for this purpose, placed as they are in the same position on the plant as the flowers, which are, to a great extent, because of their position "aborted and degraded" and starved leaves.—*A. G. Tansley.*

Yew-Trees, their Size and Age.—I have been, with my friends, measuring several big yew-trees in the south-east corner of Hampshire. Will you allow me to state the result in Science-Gossip, with a view to learning about other big yews, and with a view to description as to their age? I give the circumference—the smallest circumference of each of four trees in three neighbouring churchyards.

		ft.	in.
1. In Warblington Churchyard	.	18	4
2. ,, Redhampton ,,	.	20	0
3. ,, do. ,,	.	20	5
4. ,, S. Hayling ,,	.	33	0

Reckoning a year for every line of diameter, or twelve years for every inch, this would give to the Hayling tree, with a diameter, say, of 11 feet, or 132 inches, an age of 1584 years. Will any of your readers contribute any information as to big yews; their size, and the mode of ascertaining the age?—*P. J., Emsworth.*

Campanula glomerata.—I was very much surprised to find a number of plants of this species in full flower in the first week of the present month of November. They were on the Downs, near Beachy Head. I suppose this unseasonable blossoming is to be attributed to the plants having been kept back by the extraordinary drought of the past summer. I found, too, on the 10th of November, plants of *Gentiana campestris* in flower; these, too, I suppose, had been delayed by the drought. Those botanists who have only seen *C. glomerata* in localities where it attains its normal development, would scarcely recognise it as it is found here, where it does not exceed an inch or an inch and a half in height, and where it usually has only one flower, which looks like a little blue star, as it peeps out of the short grass.—*R. B. P., Eastbourne.*

Fungus Crop of 1887.—I can fully corroborate your correspondent, Mr. Waddell, in his note of last month, as to the remarkable scarcity of fungi during the past season. As he has remarked, this is more particularly noticeable with regard to the pasture species, always excepting the common mushroom (*Agaricus campestris*), which seemed to be peculiarly abundant. In fields where last year I could have gathered basketfuls of the various species of Hygrophorus, scarcely a single specimen was to be found this year, and many of the species I have entirely failed to notice. In localities where for years I have never missed a supply of *Lepiota rachodes* and *L. procerus*, not a single specimen appeared this year. Woodland species do not seem to have been so scarce, although they too have been erratic. I never remember seeing such a general profusion of *Paxillus involutus*, and *Boletus edulis* was also wonderfully prolific; one small patch never failed to supply me with a luscious dish three times a week for a couple of months. The Lactarii also seemed to be more than usually abundant, but the Russulæ appeared to be scarcer than common. Species which grow upon either dead or living trees were comparatively plentiful; and I was fortunate in finding several rich supplies of *Tricholoma personata*, which I have hitherto found to be scarce in this district.—*J. P. Soutter*, *Bishop Auckland.*

"The Annals of Botany."—No. 2 of this serial is published, containing papers by Sir J. D. Hooker, on "Hydrothrix, a New Genus of Pontederaceæ," by F. W. Oliver, "On the Obliteration of the Sieve-tubes in Laminaria;" "The Life-history of Lycopods," by F. O. Bower; "On the Terms Phyllome and Caulome," by F. O. Bower; "On the Absorption of Water, and its Relation to the Cell-wall in Mosses," by J. R. Vaizey; "On the History of Certain Plants, as Alexipharmics, or Snake-bite Antidotes," by D. Morris; "Notes on the Genus Taphrina," by B. L. Robinson; and a host of various Botanical Notes, by S. H. Vines, Schönland, Bower, Isaac Bayley Balfour, etc.; altogether making up a magnificent series of contributions to practical botany.

GEOLOGY, &c.

Encroachments of the Sea.—For some time past, the sea has been encroaching on the pretty little town of Cromer (Norfolk), which is situated on the top of an extensive range of cliffs, and, during the sea's encroachment, it has exposed a forest bed. During the last month or two the sea has been "hard at work," and has shown extensive beds of clay, pebbles, cakes of lignite, blue clay, and numerous fragments of wood, including two large trees, supposed to be fir. The following Mammalian remains, with many others, have been found:—Tarsal bones of Elephas, distal joints of *Bos*, calcareum of *Cervus libra*, joints of cervus, portions of lower incisor of Trogontherium, astragalus of Cervus, portion of hyæna's jaw, with teeth missing; several fish vertebræ, a few bones of *Platax Woodwardi;* also several root-stocks of *Osmunda regalis* which have not been previously found near Cromer. This interesting section is now filling up with sand, and in a little time will no doubt disappear.—*J. B. B.*

NOTES AND QUERIES.

Yellow (or Ray's) Wagtail.—For two or three days during the past week, my garden was visited by this pretty little bird, which I had never before observed here. I counted ten at one time on quite a small lawn, which had been newly mown, and they had evidently pounced upon some dainty insect, as they were not at all discomposed by a cat which eagerly watched, and tried to spring on them, but when disturbed, soon flew back again. The sun shining at the time displayed the brilliant yellow of the breasts of some to great advantage. Is it not unusual for them to come so near a town?—*S. M. P.*, *Weymouth.*

Munchausen Science.—(Science-Gossip, page 226).—Paragraphs under the heading of Popular Science are worse than useless when facts are not strictly adhered to, and any one who tries to prevent erroneous statements being perpetuated does good service to science. The statement that 20 or 30 feet is no uncommon length for a specimen of the marine worm *Nemertes Borlasei* appears to Mr. Williams an exaggerated magnification, and he refers to the subject under the above title. Is, however, the statement wrong, in fact, and should it be ascribed to the Baron? I express no opinion whether Kingsley's "Glaucus," published in 1859, may or not be regarded as containing "pretty stories founded on fact;" but, as to the size of the worm, I would refer your readers to Dr. McIntosh's monograph of the British Nemerteans, published by the Ray Society in 1874. He says (p. 183) in his description of it, "Body 15 to 30 feet, to as many yards in length, and from 1 to 4 lines in breadth. . . . even now I am not quite satisfied about the limit of its growth, for after a severe storm in the spring of 1864, a specimen was thrown on shore at St. Andrews which half filled a dissecting jar 8 inches wide and 5 inches deep—30 yards were measured without rupture, and yet the mass was not half uncoiled."—*H. Ramsden, M.A., F.E.S.*

Lacuna pallidula.—Can any correspondents tell me why, though *Lacuna pallidula* and *Lacuna vincta* are described as "plentiful on our shores," we so seldom find even an empty shell, especially of *L. pallidula*? Which kind of sea-weed is it the animal feeds on? I have not yet succeeded in getting a living specimen of any Lacuna.—*C. E. Gubbins.*

Lapidary Work.—In answer to F. Hayward Parrott's enquiry on "Lapidary work" I beg to send the following extract from "English Mechanic," August 5th, in answer to any enquiry on "Polishing Pebbles." "Here are a few hints which may be useful, and if the querist should happen to be at the seaside next autumn, he may see the work done.

The apparatus which the lapidaries, who abound at every seaside town, use for cutting and polishing pebbles, is usually of the roughest kind. The tools required are: a lathe of the most simple description, a piece of sheet-iron or tin-plate about four inches in diameter, rounded and fitted to the lathe like a circular saw, a tool like a butcher's steel, with a square point tempered hard, a slab of Bath stone (flag), and a small piece of Water-of-Ayr stone (known in lithography as snake-stone, or the latest name given it is Tam-o'-Shanter stone). The circular plate dips into a trough containing a mixture of emery, quartz, sand, and water. With it the pebbles may readily be sawn into slices. The slices must then be affixed to a wooden face-plate by means of a cement composed of resin, shellac, and Venice-turpentine. You will thus be enabled to turn them to the desired shape. They are polished by rubbing on a flag of Bath stone with a little fine emery. This will make them pretty smooth. To get a fine polish rub them in the same manner, using putty powder instead of emery, or you may rub with Water-of-Ayr stone. To give the operator a command of the stone he is polishing, it is usual to fix it in the centre of a flat piece of wood, about two feet long, with the cement before mentioned. The stone must be kept wet whilst being operated upon. Many of the pebbles found on the sea-shore contain fossil remains, which are brought out in a striking manner by polishing, and as the substance in which the fossils are imbedded is frequently semi-transparent, the pebbles may be dried and used as photographic negatives."—*S. Mason, Gloucester.*

POISONOUS FUNGI.—Could any of your botanical readers supply me with the names of the fungi eaten in the two fatal cases of poisoning which occurred in Northumberland, and at Bexley, Kent, in September; also in any other fatal case?—*P. F. G.*

TYPES OF STORM CLOUDS.—I do not know whether Mr. Barber is really serious in proposing the fantastic names for clouds which he gives, but it really seems that if we go into the classification of clouds after his fashion, we shall have a list as long as a "main t' gallant bowline." What is wanted is a simple classification for ordinary observers, and a complex scientific one for those more advanced; a classification of clouds into two families of Stratiforius and Cumuliforius meets the former case, and an extension of this, as proposed by the Rev. Clement Ley, the latter. A knowledge of forecasting can never be gained if simply the forms of clouds are to be noted: a meteorologist must understand the conditions on which the clouds are formed first, then deduce his forecast from this.—*David Wilson Barker, R.N.R.*

BADGES WORN IN TIME OF WAR.—I have had in my possession for a great number of years, for it was given to me by the daughter of an English officer who served in the American War of Independence—a seed-ball of the American "button-tree," which I was told had been worn in the button-hole of an officer of the American party at the Battle of Bunker's Hill, as a "distinguishing badge." My specimen presents the appearance of having been so worn—the fruit-stalk has been twisted until it has been reduced to a bundle of fibres, which together are so strong and tough that there would be much difficulty in breaking them. Is there any record of these curious "button-balls" having been so worn by the soldiers who took the American side in the War of Independence?—*Francis Brent, F.S.A., Plymouth.*

FISH CULTURE IN FRANCE.—M. Jousset de Bellesme, Director of the Trocadéro Aquarium, who for the past two years has been endeavouring to acclimatise American salmon in France, has just given a lecture on the subject, explaining the results achieved so far. In June last year, he deposited 22,000 salmon fry of the American species hatched in the Aquarium at eleven points of the basin of the Seine from Rouen to Les Andelys, in batches of 2000. The fish were then a trifle over four inches in length. In October following a few of the fish caught in the Loing and the Iton were found to have increased to nine inches. Owing to the great mortality among the small fry hatched this year, which M. de Bellesme attributes to the substitution of Seine water for the pure water from the Vanne, he has succeeded in rearing only 10,000 salmon fry and 40,000 trout.

MUNCHAUSEN SCIENCE.—When sending you a paragraph a few days ago, in reference to this heading, I had not noticed that Mr. Bolton had already (p. 237) called the attention of your readers to M'Intosh's British Annelids.—*H. Ramsden.*

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.

R. C. C.—Get Stark's "British Mosses," coloured plates, price 7*s.* 6*d.*

W. HANNAN WATSON.—Apply to Mr. Henry Laver, F.L.I., Trinity Street, Colchester, for information concerning the black rat, etc.

H. W. LETT.—Your paper on the "Sunflower" shall appear shortly.

COLONEL.—*Salticus tardigradus* is not an uncommon species of spider. You will find a full account of it in Staveley's "British Spiders," and also in Dr. Blackwall's work on British spiders.

G. W. BULMER.—We shall be pleased to receive any paper you may send us.

A. BENNETT (Croydon).—Unfortunately your paper arrived too late for the January number, as we had to go to press very early on account of the holidays.

G. E. EAST.—There formerly existed a "British Natural History Society," but it was in reality for the purpose of distributing sets of specimens to subscribers. We believe it has ceased to exist.

EXCHANGES.

FOR exchange, back vols. of "Entomologist," "Young Naturalist," "Union Jack," "Naturalist," also odd numbers of "Entomologists' Monthly Magazine," and other periodicals; full list sent on application. Dragonflies wanted in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

SKINS of weasel, hedgehog, and long-eared bat, etc.; specimens of *Sirex gigas, Gonepteryx rhamni, Lycæna argiolus,* and scores of other Lepidoptera. Wanted, dragonflies in good condition.—W. Harcourt Bath, Ladywood, Birmingham.

COLLECTION of British land and freshwater shells, all mounted and named, also minerals, fossils, marine shells, etc., offered for dragonflies, either British or foreign.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, foreign frogs and toads, alive, preserved in spirits, or otherwise.—W. Hannan Watson, 219 St. Vincent Street, Glasgow, N.B.

OFFERED, Indian pappoose-holder, doll, redstone pipe bowl, bow and arrows, buckskin tobacco-pouch, mocassins, land, freshwater, and marine shells. Wanted, land, freshwater, and marine shells, especially from southern countries. Send lists.—Thomas E. Addy, 54 North Franklin Street, Janesville, Rock Co., Wisconsin, U.S.A.

WANTED, British ferns and grasses in exchange for flowering plants or books.—J. W. B., 56 Vine Street, Liverpool.

AN herbarium of British plants and mosses for what offers?—J. H. Lewis, F.L.S., 145 Windsor Street, Liverpool.

A COLLECTION of botanical books and others for other books of general interest.—J. H. Lewis, F.L.S., 145 Windsor Street, Liverpool.

WANTED, a genuine clutch, with full data, of eggs of golden eagle, must be Scotch.—G. T. Phillips, Wokingham, Berks.

WANTED, *Pisidium roseum*, *Bythinia Leachii*, *Limnæa glutinosa* and *involuta*, *Testacella haliotidea*, *Helix lamellata*, *Helix pygmæa*, *Helix obvoluta*, *Bulimus moktanus*, *Clausilia biplicata*, and *Acme lineata*. Good exchange.—F. R. Fitzgerald, Clifford House, Harrogate.

WANTED, vol. i. of Dr. Jeffreys' "British Conchology" and Hartings' "Rambles in Search of Shells."—F. Fitzgerald, Harrogate.

WANTED, fossil land and freshwater shells. Good exchange.—Fitzgerald, Harrogate.

WANTED, eggs of barn and long-eared owls, jay, chough, Dartford warbler, green woodpecker, red grouse; also nests of British and foreign birds. Good exchange.—Fitzgerald, Harrogate.

FOR exchange:—COINS.—Silver: Elizabeth. Copper: Jas. II., Wm. III. & Mary, Wm. III. Copper: Guernsey (8 doubles and 4 doubles), St. Helena (halfpenny), Nova Scotia (halfpenny), Columbia, Sierra Leone Company (¼ anna). Silver: Hong Kong (10 cents). Copper: Belgium (5 cents and 2 cents), Norway: Carolus XIV. (2 skillings), Carolus XV. (2 ores), Oscar (⅗ skilling). Canton Schwyz (2 rappen). EGGS.—Wild duck, moorhen, plover, red-backed shrike, great tit.—F. R. Arundel, Friends' School, Saffron Walden.

NEVADA diatom deposit, clean, ¼ oz., for four good diatom or foraminifera slides, or for equal quantity of other cleaned diatom deposit.—Hutton, Mottram, Manchester.

MICROSCOPE, in good condition, monocular body, A and C eye-pieces, three objectives forming one, frog plate, animalcula cage, condenser, &c.; will exchange for ⅛-objective or offers. Wanted, stage micrometer; will exchange live or dead specimens of *Hydrophilus piceus* (beetle).—W. Turner, 89 Terminus Road, Eastbourne.

WANTED, SCIENCE-GOSSIP for Feb. 1884, having a coloured plate, in exchange for that of Jan. 1884, with coloured plate, or one mounted parasite micro slide.—T. S. Morten, 28 Haverstock Hill, London, N.W.

WANTED, eighteenth or nineteenth century tokens or coins, or medals; exchange, fossils from chalk, Thanet sands, etc.—Fred. Stanley, Margate.

HAS any reader a superannuated rain gauge to dispose of? Required for class illustration, not for actual rain measurement: its being defective for latter purpose will not matter, if perfect enough to illustrate the principle.—Wm. Jacobs, 12 Selwyn Villas, Munster Road, Fulham, S.W.

ANY reader of SCIENCE-GOSSIP possessing a catalogue to one of the £5 5*s*. collections of minerals and fossils by the late Mr. J. Tennant (149 Strand), is requested to communicate with—H. J. Torpey, 120 Gower Street, W.C.

FOR exchange, scales of roach and black snake of Australia for microscopical purposes. Minerals: sylvanite (telluride of gold), auriferous quartz, Labradorite. Shells: *Tapes virginea*, *Cypræa pantherina*, *Pentunculus glycimeris*. All kinds of natural history objects wanted in exchange; also books on natural history.—E. O. Meyers, Richmond House, Hounslow, W.

WANTED, to exchange a number of good dried specimens of North American plants for continental or other foreign species. Will also exchange with N. American collectors, giving British and Continental in exchange.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

Eumenes coarctata, some splendid cells containing live grub of this rare insect, all British. What offers?—F. Dolamore, Avenue Road, Bournemouth.

WANTED, live or dead specimens of *Vitrina pellucida* and varieties; exchange given in freshwater shells.—W. E. Collinge, Springfield Place, Leeds.

LIASSIC and magnesian limestone fossils offered in exchange for mountain limestone fossils.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

MICRO SLIDES.—Pollen of *Salvia patens*, in glycerine jelly; Sphœrocrystals of cactus, dry; *Phragmidium bulbosum*, in C. B.; and *Phragmidium gracile*, in C. B.; to exchange for other mounts. Mutual approval.—Rev. H. W. Lett, M.A., Aghaderg Glebe, Loughbrickland, co. Down.

MOSSES.—Wanted, to exchange mosses from north of Ireland with former or new correspondents. I have *Climacium dendroides* in fruit.—Rev. H. W. Lett, M.A., Aghaderg Glebe, Loughbrickland, co. Down.

FOR exchange, Dilatatus and others for other land and water shells.—Sam. Clough, 21 Abingdon Street, Blackpool.

WANTED, British marine shells in exchange for *Vaccaria Wigghii*, *Dudresnaia coccinea*, and other rare algæ.—Mrs. Hodgson, Chalgrave Vicarage, Leighton Buzzard, Beds.

FIRST-CLASS lantern slides, 3¼ × 3¼, consisting of photo-micrographs of insects (whole and part), insects and vegetable parasites, diatoms, botanical subjects, etc.; list sent. Wanted, good micro slides, microtome, ⅙-inch or ¼-inch objective, or offers.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

FOR exchange, "History of British India," by Edward Thornton, 1845, 6 vols., cloth 8vo, in good condition; "The Law relating to India and the East India Company," 1841, cloth 4to., published at £3 3*s*. Books on natural history taken in exchange.—E. O. Meyers, Richmond House, Hounslow, W.

A FEW good slides of spread diatoms in Tolu in exchange for other slides of Diatomaceæ—spread preferred. Send list.—E. B. L. Brayley, Rockdeane, Hughenden Road, Clifton, Bristol.

AMMONITES, British and foreign, wanted; exchange in fossils, etc.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

LARGE collection of foreign shells offered in exchange for British.—Miss Linter, Arragon Close, Twickenham.

GOOD collections of minerals, including many fine and rare cabinet specimens; also collections of Echinoderms. Will exchange for good shells; list on application.—Miss Linter, Arragon Close, Twickenham.

Unio margaritifer (from the only known Lancashire locality) and *A. cygnea* and vars. for specimens of same species, or *U. tumidus* and *U. pictorum* from other localities.—R. Standen, Swinton, near Manchester.

WANTED, tropical marine mollusca. Offered, "Popular Conchology," by Agnes Catlow, 1843, describing families and genera, with 312 woodcuts; also "Common Objects of the Sea Shore," by Rev. J. G. Wood; "Geology for the Million," by M. Plues; and "Insect Transformations," part 2, 1830.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

WELL-MOUNTED slides of Foraminifera, Echinodermata, Polyzoa, Diatomaceæ, fish scales, crystals, and spicula, in exchange for other well-mounted slides; lists exchanged.—W. M. Ranson, The Cottage, Priory Road, Anfield, Liverpool.

BRITISH and foreign specimens of marine and land shells offered for others not in collection.—J. T. T. Reed, Ryhope, Sunderland.

HARTING'S "Rambles in Search of Land and Freshwater Shells," coloured plates, and "Reign of Law" (Argyll), for continental Anodons or Unios, or good figures or tracings of same.—George Roberts, Lofthouse, Wakefield.

ENGRAVINGS of varieties of Anodons and Unios for specimens of shells of various forms of British or continental anodons or Unios.—George Roberts, Lofthouse, Wakefield.

BOOKS, ETC., RECEIVED.

"Bees and Bee-keeping," vol. ii., by Frank R. Cheshire (London: Upcott Gill).—"Living Lights," by Charles F. Holder (London: Sampson Low & Co.).—"The Creator and Creation," by W. H. Dallinger (London: T. Woolmer).—"The Microscope," translated from the German of Professor Carl Naegeli and Professor S. Schwendener (London: Swan Sonnenschein, Lowrey, & Co.).—"Elements of Mineralogy," by F. Rutley (London: Thomas Murby).—"The Young Collector Series: Ants, Bees, Dragonflies, Earwigs, Crickets, and Flies," by W. H. Bath (London: Swan Sonnenschein, Lowrey, & Co.).—"The Photographer's Indispensable Handbook," by Henry Sturmey (London: Iliffe & Son).—"An Elementary Treatise on Light and Heat," by Rev. F. Wilkins Aveling, M.A., B.Sc. (London: Relfe Bros.).—"Elementary Microscopical Manipulation," by T. Charters White (London: Roper & Drowley).—"Proceedings Folkestone Nat. Hist. Soc."—"Geology of Portland Promontory, W. Victoria," by G. S. Griffiths.—"Ottawa Naturalist"—"Journal of Conchology."—"The Microscope."—"The Naturalist's Monthly."—"Annals of Botany," No. 2.—"Journal Quekett Micro. Club," Dec.—"Feuille des Jeunes Naturalistes."—"Essex Naturalist"—"American Monthly Microscopic Journal."—"Journal of Microscopy"—"Century."—"Gentleman's Mag."—"Belgravia."—"Midland Naturalist."—"Wesley Naturalist."—"American Naturalist."—"Victoria Naturalist."—"Garner."—"Amateur Photographer."—"British Dogs," No. 13.—"The Naturalist."—&c., &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 8TH ULT. FROM: J. S.—F. M.—C. P.—H. D. G.—C. P.—Rev. H. W. L.—A. G. T.—F. R. A.—H.—F. R. F.—J.—W. B.—C. W. D.—J. E.—P. J.—T. D. A. C.—R. G. W.—L. N.—G. A. P. C.—J. J. M. I.—A. G. T.—J. H. L.—J. E.—W. H. W.—F. S.—T. H.—W. J.—R. P.—F. C. G.—H. J. T.—E. C. M.—A. H. A.—J. B.—W. T.—E. A. H.—A. R.—T. S. M.—A. E. L.—W. A. C.—H. H.—E. O. M.—B. T.—Dr. S.—G. R.—P. F. G.—J. T. T. R.—W. M. R.—G. E. E., jun.—T. W.—W. J. J., jun.—T. W. C.—R. S.—L.—J. H.—W. E. C.—E. B. L. B.—E. C. M.—E. C.—T. S.—W. D. S.—T. C.—E. S.—C. P. L.—J. B. B.—S. C.—F. E.—J. E. F.—Rev. J. E. W.—J. C.—C.—A. T.—H. P. S.—J. E.—B. T.—C. L. L.—R. D. P.—T. H.—A. R. F. W.—&c.

NOTES ON GEOGRAPHICAL DISTRIBUTION.

By T. D. A. COCKERELL.

AS year by year Science becomes more complicated, and the array of ascertained facts so vast as to be far beyond the grasp of any single brain, specialism must of necessity exist, and not only this, but to know anything thoroughly one must be more or less a specialist.

Nor is this to be regretted, since nearly all the knowledge of later days has been gained from workers in particular groups, and it is certainly true, that the man who knows one group well knows the principles of life, heredity, variation and distribution, so far as they can be known, and is able to apply these principles with nearly equal facility to other groups. Yet there is one kind of specialism very rife that I do protest against, as being productive of inconceivable misconception and narrowness of mind; that specialism which studies a group only as it occurs in a particular country or district, and cares nothing for its distribution or variation without that limit. And in thus protesting, I do not wish to say anything against local lists, which to me have the greatest value, or against those who give most attention to the fauna of their own district, for it is most natural and right that each should study what comes most directly under his observation, but against the feeling of contempt for all foreign species, and that ignorance which knows that *Vanessa antiopa* is a very rare butterfly which used formerly to be found at Camberwell, and thinks there is nothing more to know.

My object, therefore, in this paper, is to rouse up some measure of interest in the foreign distribution of our British species among those who have hitherto regarded them from the British standpoint alone, and to show how we owe much of our native fauna to immigration, and on the other hand have from time to time sent forth emigrants to people other lands.

In a former note I attempted to divide up the British Mollusca into three sections, the Northern, Eastern, and Western; or otherwise, the Boreal, Germanic, and Lusitanic, and asked for adverse criticisms upon this arrangement, so that it might be put to the test. Dr. Kobelt, in an article published in Germany, took exception to the classification of a few species, but agreed with it in the main, and beyond this nobody seems to have disputed my division of our fauna, which is based upon that proposed by Forbes many years ago.

The circumpolar region it may be supposed, was at one time temperate in climate, and possessed a fairly uniform fauna and flora. Cold coming on, drove all forms of life southward, and hence the same species appeared simultaneously in Central Europe and Central North America, meeting and mingling with the fauna of the south—and thus was formed our British boreal fauna and flora.

Next, the question arises, how are the boreal types to be distinguished from the eastern and western? Their distribution in Britain is certainly some guide to this; the northern forms being mainly prevalent in Scotland and the North and West of Ireland, in which last district they mingle with the western; but *Planorbis parvus*—certainly a boreal type, is found in Devonshire and Surrey, and *Cochlicopa lubrica* is universal. One test alone seems to me a sure one, and that is by comparison with the North American fauna:—*Whatever form in Britain is represented in North America by an identical or very nearly allied species belongs to the boreal type, except such as have been introduced by human agency, and perhaps certain migratory species.*

Possibly, it does not always exclude a species from

the boreal fauna that it has no representative in North America, since there are forms peculiar to Northern Europe and Asia which are not American; yet I myself should be disposed to regard these as belonging rather to the Germanic than boreal type—as for instance, *Limax cinereo-niger*, which I had formerly considered boreal.

Another difficulty, and this a more serious one than might be supposed, is that of distinguishing which are the imported species in America.

One might think that there was no doubt that *Vanessa atalanta* was indigenous to America, yet Harris asserts that it was introduced from Europe with the common nettle, and considering that *Pieris rapæ* was only introduced into Canada about 1857, and now occurs abundantly even to the Rocky Mountains and Georgia, doing damage to the cabbage crop estimated at thousands of dollars annually, it is hard to prove the nationality of a species by its present distribution.

So much for the specific forms, but how is it in the case of certain genera, such as Apatura? The European species of this genus are few, and the several species in America are decidedly southern in their distribution, *A. alicia* occurring from Texas to Florida, *A. celtis* not farther north than Virginia, and so on. This undoubtedly requires some explanation other than that of boreal origin, especially as it is by no means an isolated case, and the only one I have to offer is the following. In the Isle of Wight there are found fossil land-shells more nearly allied to West Indian than any European forms, and from this and other evidence it seems certain that ages ago there was some connection between Southern-Europe and what is now the West India region (Southern Africa being at the time probably cut off by the submergence of the central region) and a similar fauna existed throughout. The glacial period destroyed this fauna in Europe almost entirely—Central Africa being under water it could not migrate southward, and the American connection was cut off. But a few species survived in the Mediterranean region, and were the origin of Apatura in Europe, and such shells as the Mediterranean *Tudora ferruginea*, allied to common West Indian forms.*

I am at present situated in a district, the Rocky Mountains of Colorado, peculiarly interesting from a geographical distribution point of view. The high mountain peaks, rising to over 14,000 feet, and continuous to the Arctic regions of British America, have been an easy pathway for the migration of boreal species southward, while a very different and un-European fauna occupies the lower regions, and mingles with the others on the mountain-side.

Of the forty-eight species of Mollusca ascertained to occur in Colorado, no less than fifteen may be considered specifically identical with British forms, and nine others are very closely allied, while the remainder belong to the peculiarly American fauna.

The fifteen European species, besides being found in Colorado, have a wide distribution and are doubtless native in America: *Vitrina limpida* (*pellucida*) is found in Massachusetts and Manitoba; and its variety *angelicæ* in Greenland; *Hyalina nitida* occurs in Michigan and Massachusetts; *H. viridula* (*radiatula*) as far north as Alaska (W. H. Dall), and east as Mass.; *Conulus chersinus* (*fulvus*) is found in Ontario and many other localities; *Helix pulchella*, var. *costata*, ranges to Anticosti Islands, and the type (*lævigata*) is common in Canada; *Cochlicopa subcylindrica* (*lubrica*) is abundant from Alaska to Mass.; *Pupa marginata* is found in Mass., where there also occurs its variety *edentula*; *Succinea ovalis* (*pfeifferi*) is common in the eastern states and Canada; *Limnæa stagnalis* occurs in Manitoba, Ohio, &c., and there is an American variety, *speciosa*, Zgl., of which I have seen English specimens collected in Yorkshire;* *Limnæa palustris* is universally abundant in the Eastern States and Canada, and very variable; *L. humilis* (*truncatula*, var.), is also generally distributed and common; *Physa hypnorum* occurs in Illinois, Ohio, Manitoba, &c.; *Planorbis parvus* (*glaber*) is a well-known eastern and Canadian species; as are also *Pisidium abditum* (*pusillum*) and *P. variabile* (*fontinale*, subsp.).

There are, however, several species of European mollusca which have been introduced into America, and must on no account be confounded with the boreal fauna, such as *Helix Cantiana* in Canada, and *Limax maximus* (*cinereus*) in the northern, and *Helix terrestris* in the southern states.

(*To be continued.*)

THE WEATHER.†

THIS is an excellent book which was greatly needed. For many years observers have been noting their observations of barometers and thermometers, yet the great mass of these observations have been practically of but little use.

A few years since we heard a great deal about "the gay science." Most persons have mistakenly considered meteorology as the dismal science. Those who carefully peruse Mr. Abercromby's book will have no good excuse for still holding that opinion.

The first three chapters, which form Part I. of the book, are elementary, being weather-science and forecasting the weather. These chapters refer to

* And it is probable that the European genus Clausilia migrated to the West Indian and South American region during the same period.

* This variety differs from the type in its invariable tawny colour, its decided, almost regular striation, narrower aperture, outer lip less curved and not prominent, and its delicate closely-adherent white columellar callus.

† "A Popular Exposition of the Nature of Weather Changes from Day to Day," by the Hon. Ralph Abercromby, F.R.M.S., etc. etc. (London: Kegan Paul & Co.)

observations of instruments and observations of the clouds.

Part II. of the book is advanced, and contains fifteen chapters. The headings of a few of these chapters will give some idea of their contents : Wind and Calm, Heat and Cold, Squalls and Thunderstorms, Whirlwinds and Tornadoes, Types and Spells of Weather.

After describing very clearly how isobars are formed, the author shows the relation of the velocity and direction of the wind to them, and the influence of different shapes of isobars in modifying the distribution of heat and cold from day to day in various parts of the world. Then the supposed relation between sunspots and rainfall is considered, and it is pretty clearly shown that no connection can be traced between them. For instance, in the year 1872—a year when there was a maximum of sunspots—Buchan plotted the rainfall of Scotland, and found that while near Aberdeen the rainfall was seventy-five per cent. above the average, the amount of rain at Cape Wrath, about one hundred miles distant, was below the average. The author justly inquires why we should take the returns of one station more than another to compare with sun-spots, seeing that they should affect the whole world simultaneously.

In a book on weather prediction so complete, it is curious to find no reference to the use of the Rain Band Spectroscope for predicting rain locally. Those who have tried the instrument know that it is of the highest value for this purpose.

Writing now on the evening of December 4th, the barometer has been falling steadily since mid-day on the 1st instant—that is, successively night and day for three days. This morning, about 8 A.M., the clouds were very low and threatening, the atmosphere near the earth clear, so that hills six miles off were seen sharply defined ; every appearance would have induced one to believe that rain was imminent. On observing the spectrum with the spectroscope, I found an almost total absence of the rain band ; indeed, there was so little that only a well-trained eye could have detected it. No rain has fallen throughout the whole day.

I have in my mind a case of positive prediction instead of negative, perhaps to many still more convincing. On the eve of a Bank Holiday recently, one of my friends, who had come into the country to stay with me for several days, said to me, "We are going to have a glorious day to-morrow." My reply was, "I am sorry to say we shall have a wet day to-morrow." "Nonsense," said my friend, who is something of a meteorologist, "the barometer has been rising for the last day or two, and we had a beautiful pink sunset." My answer was, "There is a strong rain band in the spectrum." The next morning, soon after 8 o'clock, it began to drizzle ; by 9 o'clock it was raining pretty fast, and it poured almost continuously during the whole day. It would be easy to multiply such instances to almost any extent.

Few persons are aware that a barometer rises very quickly an hour or two before a thunderstorm. This can seldom be observed, excepting on the diagrams taken with a self-registering barometer. A capital illustration is given in "Weather," by means of photography, from one of these diagrams. This sudden rise is mostly followed by two or three **V**'s, resembling several reversed **W**'s, with the **V**'s becoming smaller and smaller, thus—**ΛΛΛ**, but the **V**'s irregular in size.

It is pretty well known to my friends that I sleep so soundly that no thunderstorm will wake me. On one occasion recently, at the breakfast table, I was told there had been a thunderstorm in the night. I immediately replied there had been two, about three hours apart. "How can you know that, when they never wake you?" was the inquiry. I told them that before I dressed I had consulted my self-registering barometer. As no one in the house had heard the two storms, my information was evidently doubted. Shortly afterwards a friend came in, who referred to the two storms, and said they were about three hours apart.

Considerations of space will not permit me to give an adequate idea of the matter in the volume, which consists of about five hundred pages, and contains nearly one hundred illustrations. It not only brings together all the knowledge we at present have on the subject of the weather, but it gives also the results of the author's original and unpublished researches, which are of great interest and value.

Mr. Abererombу's book is indispensable to all who wish to understand the present position of applied meteorology, as excmplified in weather forecasts.

JOHN BROWNING.

CHATS ABOUT ROTIFERS.

(ERTEMIAS TETRATHRIX.)

THIS singular and rare rotiferon has been classified as belonging to the family Anurœdæ, genus Ertemia (Gosse).

The lorica is smooth, and shaped like a deep obconic wine-glass, of which the foot is represented by a long attenuated rigid bristle. Three similar bristles project from the front edge of the lorica. The centre bristle (the longest of the three frontal ones) springs from the dorsal margin, and is about one-fifth longer than the two side bristles.

The head is projected a short distance from the mouth of the lorica, and crowned with a wreath of closely set vibratile cilia.

Its eye is large and of bright red colour, and is situated a short distance down from the mouth, and just above the mastax.

The water vascular organs are conspicuous. The

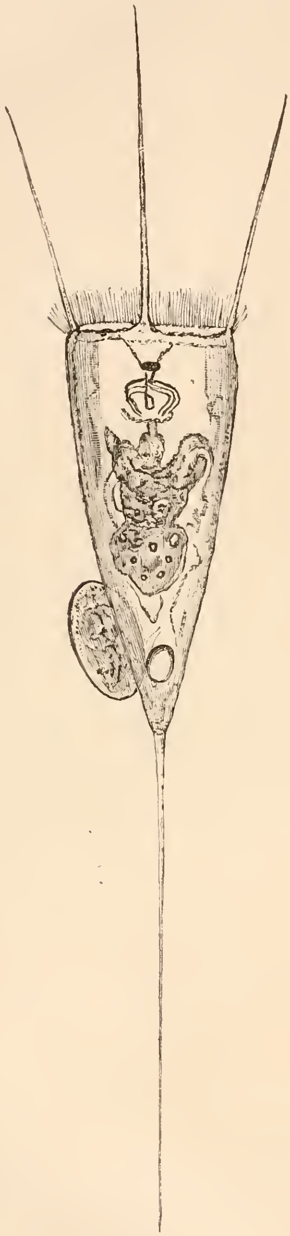

Fig. 13.—*Ertemias tetrathrix.*

tortuous tubes, with vibratile tags (three on each side), are distinctly discernible with a power of 500 diameters. The contractile vesicle is large, and situated below the digestive organs, at the contracted posterior end of the lorica.

It was in August, 1885, that I had the good fortune to discover this remarkable creature in Stormont Loch, Blairgowrie. On examining a fragment of milfoil, which I had dredged from the bottom of the loch, in a zoophyte trough, with the water, I observed the *E. tetrathrix* busy nibbling at a colony stock of *Codosiga umbellata*. This beautifully pedicled and collared Flagellata, as well as a number of other forms of Pedicled Infusorians were thickly attached to the leaves of the milfoil, which seemed to form the chief article of food of the *E. tetrathrix*. It did not leave the colony of *C. umbellata* until it had eaten most of the zooids from their foot-stalks, then left the colony stock a complete wreck, to attack a fine specimen of *Acineta grandis*. But the zooid quickly retired to the bottom of its cup-shaped lorica, and there baffled the efforts of the *E. tetrathrix* to extract it, which left the *A. grandis* little the worse for the assault.

Its manner of swimming is unique. It swims quite as easily and gracefully backwards as forwards. It is the only species of the whole Rotifera I have met with that can voluntarily reverse its motion.

It will swim forwards amongst the leaves of the plants and confervoid filaments, then shift its quarters by swimming backwards quite as swiftly as by the forward motion. I have seen many examples of this creature, both in the summer of 1885 and 1886. This voluntary reversing of the motion was a phenomenon in every individual specimen.

Its egg is oblong, and after extrusion is fixed by a gelatinous matter to the posterior of the lorica on the ventral side, and there carried until hatched.

Length from tip of the centre frontal bristle to the tip of posterior bristle, $\frac{1}{40}$ of an inch. Length of lorica, $\frac{1}{150}$ of an inch.

JOHN HOOD, F.R.M.S.

Dundee.

SECTION-CUTTING.

THE following remarks, supplementary to Mr. Underhill's admirable paper in the last issue, may be of some interest. In preparing specimens for mounting, the guiding principle in all the necessary manipulations should be to avoid any sudden change of density. For instance, it would not do to transfer such delicate tissue as that of a Medusa from 30 per cent. alcohol to 70 per cent. without first placing it for a few minutes in 50 per cent. As a rough rule, in passing a tissue which has been treated with some such hardening substance as corrosive sublimate up from water to absolute alcohol, the strength of the solution should be increased 10 per cent. each time, and the substance should average ten minutes in each, the time being slightly longer in the earlier stages. Corrosive sublimate is by far the best agent for first killing or fixing specimens, which

may remain in a saturated solution for three or four hours. To kill animals in an expanded condition it may be used hot, and immediately replaced by cold solution. As an instance of its use, suppose one is dealing with the contents of a surface net, all animals of the most extreme delicacy. To the sea water in which these are swimming about add a small quantity of solution of ferric chloride, which will kill the organisms most effectually. They will now sink to the bottom and form a sediment, from which the sea water may be poured off. Fill up with saturated solution of corrosive sublimate,* and leave for three or four hours. Then thoroughly wash with distilled water, by decantation, until all traces of sublimate have disappeared, and pass up into 70 per cent. spirit in the way mentioned above. Specimens may be now labelled and laid aside, for they will remain unaltered for an apparently indefinite time.

Now a few words as to staining. In the Cambridge Morphological Laboratory, all the preparations are stained before cutting, and the beautiful results obtained there quite dispose of the theory that staining in mass does not give definiteness of outline. There the block of tissue, or the animal, as the case may be, is left in an alum and calcic chloride solution of hæmatoxylin for twenty-four hours. It is then washed as rapidly as possible in a solution of ·25 per cent. nitric acid in 70 per cent. spirit. This dissolves out superfluous stain, removing it in part from those portions of the tissue which have no great attraction for it, and thus gives differential staining and great definiteness of outline. The time for leaving in the hæmatoxylin is not of vast importance; all that is necessary is that the block should have time to become thoroughly filled with the stain.

Definiteness of outline appears to be much more dependent on perfect dehydration than on staining. The nitric acid solution may be replaced by 70 per cent. spirit, this by 90, and this by absolute.

By far the most delicate method of imbedding is the following. The stained specimen is left in the absolute alcohol until it is thoroughly permeated (a matter of a few minutes only); then, with a pipette, place a quantity of chloroform sufficient to cover the specimen, at the bottom of the small bottle in which it and the absolute alcohol already are, where it will form a lower stratum. The specimen will float in the upper layer of alcohol, and will only gradually sink into the chloroform, the alcohol with which the tissue is soaked being very slowly replaced. When this is accomplished, the upper stratum of alcohol and the chloroform may be drawn off with the pipette, and a little fresh chloroform added. Now shred some paraffin into the bottle, cork loosely, and leave for a short time at a temperature of about 30° C. The paraffin will be slowly dissolved by the chloroform, the density of the fluid equally slowly changing, and permeate the tissue. Raise the temperature to 60° C., and the chloroform will be driven off, and when this is completed, as determined by smell, transfer to a larger quantity of melted paraffin, and imbed in the usual way.

I am inclined to endorse Mr. Underwood's dictum, that the hardness of the paraffin should be varied according to the surrounding temperature. The temperature of the Cambridge laboratory is tolerably constant, from the method of heating, so I cannot speak from experience. There we use two kinds of paraffin, "hard" and "soft," the latter being of such a low melting-point that it can be moulded in the fingers at the ordinary temperature. The soft paraffin is used first, before passing into hard paraffin. It is also extremely important as an aid to obtaining "ribbons," serving, from its pliable nature, as a cement to unite the different sections together. To this end the little cubes are coated on only two sides with this soft paraffin, in the line in which the ribbons are intended to run. They are generally dipped bodily into some hard melted at a low temperature, and then the soft paraffin is carefully removed with a knife, except where wanted. I find it easiest myself to melt a little on the blade of an old scalpel, and apply as thin a layer as possible in that way, and on the two sides of the cube only on which it is needed.

None of these statements are intended to traverse Mr. Underhill's remarks, since he was dealing only with insects, and I have had no experience of them.

W. B. H.

Cambridge.

* It is found best to make the solution with sea-water when it is to be used for marine organisms.

CHAPTERS ON COLOUR.

By S. A. Notcutt, jun., B.A., B.Sc.

No. II.

TURNING to the mixture of pigments, we find results entirely different from those arrived at

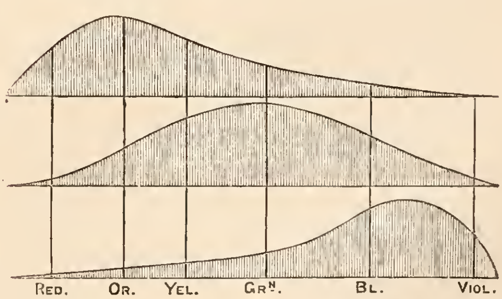

Fig. 14.—Diagram of the Three Primary Colour Sensations (1, red; 2, green; 3, blue or violet) showing the extent to which they are affected by rays belonging to different parts of the spectrum. (Helmholtz.)

by mixing coloured lights. We know that blue and

yellow light form white, whereas blue and yellow pigments form green. Now we have seen that the colour of a pigment is due to the absorption which light undergoes in passing through the surface layers, and in being reflected back from the interior. We may represent the surface layer of a blue pigment by a piece of blue glass placed on white paper; if we now place a piece of yellow glass over it, what will be the colour of the paper? The blue glass transmits violet, blue, and green rays; the yellow glass transmits green, yellow, orange, and red rays; hence the only rays which the two glasses transmit in common are green rays. Therefore the paper will look green when covered by both glasses.

This is a model of what takes place when a mixture of blue and yellow pigment is spread over a white surface; green is the only colour which is not absorbed by either of them.

Dove devised a simple piece of apparatus for comparing coloured light mixtures with pigment mixtures. He covered an aperture in a piece of card, half with one coloured glass and half with another, and caused the images of the two halves to overlap by examining the aperture through a piece of doubly-refracting spar. In the overlapping of the "ordinary" image of the one half by the "extra-ordinary" image of the other, a true mixture of the lights was obtained. He afterwards observed the colour of the two pieces of glass placed one over the other. Dove's results show that coloured light mixtures of red and green are yellow, whilst pigment mixtures of the same colours are black, or very dark green. Blue-green and dark purple light form a pale blue-green, whereas the same colours in pigments form a dark violet. In fact, pigments are always darkened by mixture on the palette, for by each successive mixture the absorption of some further rays is effected, and thus we have a continual process of subtraction; each admixture is a stride towards blackness.

There are two accepted theories of coloured vision—the Young-Helmholtz theory, and the Hering theory. The former, which was published by Young in 1802, supposes that there are three colour sensations which are called forth in different degrees by rays belonging to different regions of the spectrum. One of these sensations is a red sensation, which is excited most by certain red rays, but is nevertheless affected in a certain varying degree by other rays, the effect being less the farther the rays are from the red, until in the blue region of the spectrum it is scarcely appreciable. Besides the fundamental red sensation, Young supposed there to be two other primary sensations, one being aroused to a maximum by certain green rays, and the other by certain blue or violet rays, but both, like the red sensation, being more or less affected by rays of every refrangibility. Helmholtz represented this varying capacity possessed by rays in different regions of the spectrum for awakening any one of the three sensations, by three curves (Fig. 14), the height of any point in any of the curves representing the extent to which the particular sensation is aroused by a ray belonging to that part of the spectrum. When the three sensations are aroused in equal proportions, we experience the sensation of white light; this is shown to be the case by rotating a disc with red, green, and blue sectors on Maxwell's colour-top, when the whole will appear grey. We have seen that yellow and blue light, when mixed, makes a white or grey; the reason for this is easily understood on referring to the diagram (Fig. 14), for there it is seen that a yellow ray affects both red and green primary sensations, whilst a blue ray affects both green and blue sensations, so that between the two we have the three factors required for giving rise to the sensation of white. By the diagram it is seen, too, that a yellow ray awakens the red and green sensations in about equal degrees. Now when a disc, half green and half red, is rotated, a dull yellow is the result; when the disc is made up of more red than green, the tone of the combination approaches orange, as might be expected. In the same way, other intermediate colour sensations are produced, the resultant sensation produced by any ray or number of rays being determined by the relative extent to which each of the three primary or fundamental sensations is affected. According to this theory, black is the absence of all sensation.

The Hering theory, which is more generally accepted by physiologists, is partly based on the fact that we can pick out six different colours, each of which appears to us to be quite distinct from, and have nothing in common with, any other; these six naturally fall into three pairs, which are black and white, green and red, blue and yellow. Each pair then comprises two correlative and complementary colours. The theory also depends on the existence of what are known as "visual substances." One such substance, which is of a purple colour, is found in portions of the retina of most eyes. This is called "visual purple," and is peculiar from the fact that, under the influence of light, it loses its colour, but regains it if kept in the dark. Hering's theory, on analogy with the phenomenon of visual purple, supposes there to be three such visual substances in the retina which are acted upon by light, and which in their changed chemical state in turn act on the fibres of the optic nerve, giving rise altogether to six colour sensations. These substances are colourless, and are constantly undergoing either a constructive or destructive metabolism. One substance awakens the sensation of white when it is breaking up or undergoing dissimilation, and of black when it is being built up or undergoing assimilation. Similarly the second substance gives rise to a sensation of red or green, and the third substance to a yellow or blue sensation, according as dissimilation or assimilation prevails in the respective sub-

stances. Further these substances are such that in the red-green substance, red rays falling on it cause dissimilation, and green assimilation; whilst in the yellow-blue substance yellow rays cause dissimilation, and blue assimilation; but all rays alike arouse dissimilation in the white-black substance. Consequently, when yellow and blue light falls on the eye, dissimilation and assimilation in the yellow-blue substance is in equilibrium; neither process goes on, and neither the sensation of yellow nor of blue is perceived, but since both rays act on the white-black substance, causing dissimilation, we perceive the sensation of white light. This has been shown above to be actually the case. An orange sensation is aroused by dissimilation of both the red-green and yellow-blue substances, purple by assimilation of the yellow-blue substance, and dissimilation of the red-green substance, and other intermediate colours by other variations in the dissimilation or assimilation of the substances.

About the beginning of the present century it was discovered that many persons are born with a deficient perception of colour, being what is called "colour-blind," and it was noticed that this deficiency, though found more or less in one out of every eighteen men in England, was very rare in women, even when belonging to a family hereditarily colour-blind. Mr. Hugo Magnus supposes that our sense of colour has been developed during the last four or five thousand years, and that the savages before that period could only distinguish a dark from a light shade. He bases this theory of the evolution of colour on philological researches, but the evident colour perception found in lower animals tends to contradict it.

To be what is called "red-blind," is the commonest form of colour blindness. A person so afflicted fails to distinguish between rose-red and bluish-green: he sees little more than two colours in the spectrum, which he calls yellow and blue, the yellow including the red, orange, yellow and green spaces. He classes all these tints as yellows, though they are really greens, because yellow being more luminous than green, excites a green sensation even more than green does itself, hence yellows are more conspicuous than greens to the colour-blind, but only by virtue of the green they contain. The extreme red, if at all faint, is invisible to a red-blind person.

Maxwell found that, for a colour-blind person, it was only necessary to choose *two* colours (instead of three), and to combine them, by the aid of his discs, with the addition of black and white, in order to match any other colour; whereas, for the normal eye, we have seen that the combination of *three* colours, with black and white, was required. By comparing the colour equations obtained from his colour top, as adjusted by a colour-blind person, with the equations obtained when the experiment was conducted by a person of normal vision, Maxwell calculated the exact colour-sensation which was wanting in the colour-blind person.

On the Young-Helmholtz theory, a colour-blind person lacks one of the primary colour sensations; thus, if he is red-blind, his colour sensations are composed of the green and blue alone.

On the Hering theory, a red-blind person lacks the red-green visual substance; hence all his colour-sensations must be made up of blue and yellow. According to this theory, green-blindness cannot exist apart from red-blindness; indeed, it has not been satisfactorily proved that this is ever really the case.

The peripheral portions of the normal retina are red-blind, and these parts form a large and increasing proportion in cases of excessive tobacco-smoking.

A certain shoemaker, named Harris, is recorded to have had scarcely any perception of colour at all, and must therefore have resembled Mr. Magnus's primeval savages.

In gas-light, we are all in much the same condition as if we were partially violet colour-blind, and by the light of a sodium flame we can place ourselves in a condition somewhat like that of Harris. The light from this flame contains only yellow rays of a particular wave length; hence yellow objects look white, and all other colours look black, or a pale yellow, if they happen to reflect a modicum of yellow with their normal colour—in other words, we can only distinguish light and shade effect.

In all practical questions of colour, we find it necessary, not only to consider the colour of the body or surface itself, but also the colour of the adjacent medium, since the colour of the body will apparently change with alterations in the colour of such medium. This is known as Contrast. Thus, a red object looks brighter on a green than on a red surface.

All contrast phenomena are the result of one of two distinct causes, being due either to fatigue of portions of the retina, or to fluctuations or error in our visual judgment. Effects produced by fatigue of part of the retina, or negative after-images, as they are generally called, have been so freely published in certain well-known advertisements, that it is scarcely necessary to mention them.

After staring steadily at a bright red object and then turning the eyes on to a grey wall, we seem to see the object again, but its colour is green instead of red; the reason being that the grey light reflected into the eye from the grey wall contains all the constituent rays of the spectrum, but the visual substance or nerves capable of awakening a red sensation having been wearied, the other colour sensations predominate, giving rise to a sensation of bluish-green, correspondiug to that part of the retina which has been so wearied. The after image is necessarily of a complementary colour to the object, since whenever a colour is subtracted from white light the remaining colour is complementary to it.

These experiments can be variously modified. By looking at a green object on a sheet of yellow paper and then removing the object, we see its after image

of an orange colour. Here the yellow paper reflects red, yellow, and green rays into the eyes; but the sensation of green is worn out and we perceive only the red and yellow rays, and these we know give rise together to the sensation of orange. Or, placing a slip of black or green paper on red paper, so as to shield part of the retina from the red rays, then on removing the slip an image of it is seen on the red ground, the image being of a brighter and more intense red.

The greatest contrast is obtained when the two colours are complementary to each other. Somewhat prolonged observation of such colours gives rise to a glimmering or lustrous appearance, which is the leading feature of another common advertisement.

An experiment of Helmholtz furnishes an example of the deception to which our visual judgment is liable. He directed two beams of light, one ordinary daylight, and one candle-light, on to a white screen, and interposed an upright rod, so that two shadows were cast on the screen, one in each beam. After adjusting the lights till the shadows were of the same depth, he found that one appeared yellow, namely that cast in the beam of daylight, and the other blue. In this experiment the whole screen is really a pale yellow, being illuminated by a mixture of white light and yellow candle-light, but we accept it as white; the consequence is that the shadow of the rod in the beam from the candle, which shadow is really pure white or grey since it is illuminated by daylight only, looks blue by comparison.

Another experiment which depends on our mistaken visual judgment consists in placing a small strip of grey paper on a brightly coloured paper and covering them with a sheet of tissue paper. The grey strip seen through the tissue paper appears of a complementary colour to the ground colour, and sometimes even more intense. This is a case of contrast between two greys, and the contrast effects are more marked than in the case of more intense colours.

Fig. 15.—*Lichomolpus sabellæ* ♀.

Fig. 16.—Posterior antennæ of *Lichomolpus sabellæ*.

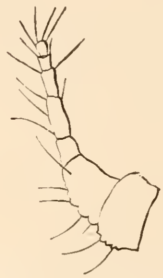

Fig. 17.—Anterior antennæ.

Fig. 18.—Pair of Swimming Feet.

A NEW PARASITIC COPEPOD.

I LATELY received from Mr. H. Chadwick, of Manchester, a specimen of Sabella, from the sandy shore at Beaumaris, N.W., which appeared to be infested with Copepoda. They were found attached to the gill filaments, to which they clung so tenaciously that it was difficult to remove them for examination without injuring the filament of the worm their host. The worm occurs in large numbers on the beach at Beaumaris, and several specimens taken were all found to be infested with the little Crustacean.

Microscopical examination clearly shows it to belong to the genus Lichomolgus, family Sapphirinidæ (Thorell), but it differs in many important points from any hitherto known species. I propose to name it *Lichomolpus sabellæ* (Fig. 15).

Its length is about $\frac{1}{12}$ inch, and with even a pocket lens it is readily distinguishable by its long narrow ovisacs and remarkable antennæ. The body is elongated; the first segment being about half the entire length of the cephalothorax which is of ovate form. The abdomen is composed of five joints: the first joint being in length equal to the remaining four joints, and proportionately broad. In the male, its lower angles are produced into two sharp narrow spines. Rostrum short and beak-shaped. Anterior antennæ (Fig. 17) seven-jointed, the two basal joints much longer and broader than the rest, and roundly serrated on the outer margin. All the joints are clothed with strong spinous setæ.

Posterior antennæ (Fig. 16) four-jointed, and very powerful; the second joint is provided with four small curved hooks placed longitudinally, and the apical segment has four large strong curved hooks, in shape much like shepherds' crooks.

The posterior foot jaws vary in the two sexes. One of the first four pairs of swimming feet is shown in Fig. 18. The fifth pair are alike in both sexes, and are composed of one joint, with a long and short strong spinous seta at apex. The animal is of a greyish-brown colour.

Since the establishment of the Biological Laboratory on Puffin Island, near to Beaumaris, under the directorship of Professor Herdman, systematic collections of material are made by tow-net day and night, and several new and rare free-swimming copepoda are already recorded; but the above new parasitic species seemed of such special interest that I ventured to describe it in your pages.

ISAAC C. THOMPSON.

Liverpool.

GOSSIP ON CURRENT TOPICS.

By W. MATTIEU WILLIAMS, F.R.A.S., F.C.S.

REMARKABLE ADULTERATION. — The following is from the columns of a popular periodical: "Materials, often largely ferruginous, are employed in the manufacture of glass for bottles, and the acids in wine act very powerfully upon these constituents, the consequence being that the liquid gets thoroughly impregnated with a solution of magnesia, or something very detrimental to the juice of the grape. When the wine thus affected, is drunk, it is found to be a sour, more or less nasty concoction."

The chemistry of this is very wonderful. The impregnation of the wine with a solution of magnesia as a consequence of the action of its acid upon ferruginous materials presents a clear case of the transmutation of metals, and the souring of the wine by the using up of its acid is another blow to modern chemistry, one of its fundamental doctrines being that an acid cannot exert its solvent or combining energies without becoming proportionally neutralised.

ELECTRIC FISHING.—One of Tiedmand's pictures in the Norwegian Summer Palace of the King of Sweden and Norway (Oscar's Hall, near Christiania), represents a peasant family spearing salmon at night in one of the fjords. A blazing fire of pine knots, or other resinous wood, is made on an overhanging cage at the prow of the boat. This light is an object of interest to the fish. While they are engaged in their investigations of the unusual phenomenon, the fatal blow is struck and they share the fate of Archimedes.

The "Scotsman" tells us that experiments are in progress in the Firth of Forth, in which the electric light is to be substituted for the glare of the wood fire as a means of piscatorial seduction. Electric lamps were sunk to a depth of forty or fifty fathoms, but the pressure of water was too great for the glass globes, which although very thick were broken by the pressure of the water. The account I have states that the glass was $\frac{5}{8}$ of an inch thick, but the size of the globes is not stated. An arc light of six thousand candle-power is described as having been used, and that further trials with stronger globes are to be made. If I dared to make a suggestion it would be to proceed more modestly at moderate depths. The Norwegians work on the surface for the lake trout and salmon. I have caught cod-fish as fast as I could haul them up by bottom fishing at five or six fathoms, and see no good reason whatever for trying such depths as forty or fifty.

THE PROPAGATION OF CHOLERA. — Certain Frenchmen have accused us of carrying cholera from India to Europe through the Suez Canal, in spite of the fact that it visited this part of the world long before the canal was made. The last visitation has been singularly fatal to this theory, according to which the cholera should follow the course of the East India ships, and therefore should make its European debut in London. Instead of this, London has escaped altogether, while Paris, and other large towns of France, Italy, &c., have suffered severely.

Herr Pettenkofer referred to this in his address to the International Hygienic Congress at Vienna, and asked the question: "Why do the English, in spite of their enormous traffic with India, where cholera is never extinct, not transfer the disease to their own country?" He replies that England's immunity from cholera is not owing to quarantines and other expensive obstructions to international traffic, such as vainly exist in Italy, France, Spain, Russia, &c., but to superior cleanliness, and attention to the removal of sewage. He adds that the general statistics of the mortality of London show that our proverb "cleanliness is next to godliness" is well founded, and that hygienic piety has been rewarded by the heavens.

ALUMINIUM.—We may hope that, ere long, useful alloys of this metal will become cheaper. In spite of the difficulty of obtaining the metal itself, M. G. A. Faurie has devised an easy and inexpensive method of obtaining it in alloy with other metals. Two parts of finely powdered alumina with one of petroleum, or other hydrocarbon, are worked into a paste well kneaded, and one part of sulphuric acid added. When the mass becomes homogeneous, with a uniform yellow colour and begins to liberate sulphuric acid, it is put into a paper bag and raised to a good red heat in a crucible. The reduced product thus obtained is finely powdered and mixed with about its own weight of the metal (also in powder) with which it is to be alloyed and raised to a white heat in a crucible. We are told that on cooling after this, more or less rich grains of aluminium alloy will be found in the middle of a black metallic powder. I have not learned whether this black powder can be fully reduced and utilised by further treatment with carbon or hydro-carbon. If so the whole process is simple enough, and cheap enough, to afford good supplies.

THE UNIVERSAL SOLVENT.—The old alchemists sought for three great arcana, the philosopher's stone,

the elixir of life, and the universal solvent; the latter being required to make gold drinkable and thus endue the body with its characteristic imperishability; drinkable gold—*aurum potabile*—being the theoretical composition of the elixir of life.

Modern chemistry has done no more than alchemy towards revealing the first two arcana, but has accomplished the third. The universal solvent has been long known, but not until lately separated, and now cannot be retained simply because it attacks everything; nothing can hold that which dissolves or destroys everything. This fury of the chemical world is the element fluorine; it exists peacefully in company with calcium in fluor spar and also in a few other compounds, but when isolated, as it recently has been by M. Henri Moissan, is a rabid gas that nothing can resist. It combines with all the metals, explosively with some, or if they are already combined with some other non-metallic element, it tears them from it and takes them to itself.

In uniting with sodium, potassium, calcium, magnesium and aluminium, the metals become heated even to redness by the fervour of its embrace. Iron filings, slightly warmed, burst into brilliant scintillations when exposed to it, manganese the same. Even the noble metals, which even at a melting heat proudly resist the fascinations of oxygen, succumb to this chemical siren at moderate temperatures. Glass is devoured at once, and water ceases to be water by contact with this gas, which combining with its hydrogen, at the same moment forms the acrid glass-dissolving hydro-fluoric acid, and liberates ozone.

Oyster Cultivation.—The victim of an ill-spent life, whose remorse on the remembrance of neglected opportunities, was lately pictured in "Punch," may yet find some consolation and opportunities of amendment. Though he may still regret that he did not eat more oysters in the irrevocable past when they were eightpence a dozen, the future is bright and hopeful. Oyster cultivation has been eminently successful in France. The exports in 1885 were 30 millions, and in 1887 they reached to about 52 millions, and the imports from Portugal to France have declined from 154,657 kilogrammes in 1883 to 1500 kilogrammes in 1887. In Tasmania, Mr. Saville Kent is equally successful. In his report for 1886, presented to the Tasmanian parliament, he shows good reason for concluding that, by extending the system he has adopted in the government reserves, and by its adoption by private enterprise, the colony may ere long establish a lucrative oyster trade. Of course we may do the same in Britain, the classic fatherland of oysters, provided the enterprise is placed in the hands of such a man as Mr. Saville Kent, *i.e.* a naturalist who is not too much inflated with professional or other official dignity, nor endowed with too large a salary to work practically himself. A savant with a salary of £1000 to £1250 per annum cannot descend to menial work; one with three or four hundred is more likely to work for his bread, even though the work demands daily wading waist-deep, in salt water. Even the plodding Chinaman has beaten us in this branch of industry. He cultivates oysters successfully, abundantly, and cheaply.

Science in China.—The irresistible march of science is striding over even the ultra conservatism of China. Imperial sanction has been given to a profound innovation, to the introduction of mathematics and modern physics, also of civil and military engineering, and still more startling, of international law and the history of the outer barbarians. All of these have now become subjects of Chinese National Education in all the provinces of the empire, and of the examinations upon the results of which the social status and the whole career of the best men of the empire depend. If this is fully carried out, some of the weary, useless, and degrading rote work connected with the old-established examinations in the ancient Chinese classics, the exercises in prose and poetical composition, Chinese history, &c., must be pushed aside. When the thin end of this education wedge is fairly inserted, we may hope that the rotten old system will soon be reft asunder. On a people who have already acknowledged so fully the supremacy of the intellect; whose old-established aristocracy is so largely built on the basis of intellectual competition, the effect of such reform must be enormous. It may even occur in the course of another generation that educational missionaries from China will visit Oxford and Cambridge to promote the modernisation of our ancient Universities, basing their advocacy on the splendid results of the pioneer efforts successfully carried forward in the Celestial Empire.

Science on Mont Blanc.—Some of the older accounts of electric displays on the summits of high mountains have been rather discredited of late; even those of de Saussure have been treated rather disrespectfully, chiefly, I suppose, because modern Alpine climbers have not confirmed them. My own experience among such climbers, especially in making an ascent of Mont Blanc so far back as the autumn of 1842, explains the negative results. The whole business of such climbing consists in reaching a certain peak, resting thereon for a few minutes to drink champagne or Kirschwasser, and take breath, then galloping and glissading down with helter-skelter pell-mell rapidity. Deliberate observation of anything beyond the reading of a barometer is out of the question in such expeditions. Last summer, however, MM. J. Vallot and Richard did some genuine work on the summit of Mont Blanc, where they erected a tent and remained for three days and three nights with the ability and appliances for making meteorological and other observations. One

of these I may quote, as it confirms some of the old and disreputed statements above alluded to. After a severe storm that imperilled their tent, M. Vallot on going out at about 9 P.M. found himself an interesting object. His clothes and his head were in the condition of the prime conductor of a working electrical machine. The rock on which he stood was in an opposite electric state to the mist around him, and his body thus became a crepitating sparkling discharger.

ASTRONOMY AND METEOROLOGY.

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

ON February the 11th, there will be a partial eclipse of the sun, not visible at Greenwich.

On February the 20th, Aldebaran will be very close to the moon.

Mercury will be an evening star in the west, near the horizon, about an hour after sunset.

Venus will be a morning star throughout the month.

Mars will be in Virgo.

Jupiter will be visible early in the morning in Scorpio.

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

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	5	8 9M	1 6A	6 3A
	12	7 55M	1 19A	6 43A
	19	7 30M	1 17A	7 44A
	26	6 54M	0 50A	6 46A
Venus ♀	5	5 29M	9 32M	1 35A
	12	5 36M	9 41M	1 46A
	19	5 38M	9 49M	2 0A
	26	5 38M	9 58M	2 18A
Mars ♂	5	11 14A	4 41M	10 5M
	12	10 56A	4 20M	9 41M
	19	10 34A	3 58M	9 18M
	26	10 12A	3 33M	8 51M
Jupiter ♃	5	2 49M	7 6M	11 23M
	12	2 26M	6 42M	10 58M
	19	2 3M	6 18M	10 33M
	26	1 39M	5 53M	10 7M
Saturn ♄	5	3 21A	11 15A	7 14M
	12	2 51A	10 46A	6 45M
	19	2 19A	10 16A	6 17M
	26	1 50A	9 47A	5 48M

Meteorology.—There being nothing of popular interest to record as regards Astronomy this month, I shall devote my space to a summary of the Meteorology of 1887.

From the observations published in the daily weather report of the Meteorological Office, it appears that the temperature rose in July to a maximum of 88 deg. and fell to a minimum of 15 deg. in January, which was the lowest reading observed for six years.

The extreme range for the year of 73 deg., was the largest observed for many years.

The mean temperature was below the average in every month, excepting June and July, and very considerably below the average in March, April, May, September, and October. The mean temperature for the year showed a deficiency of 2 deg., and, with the exception of 1879, was the coldest that we have experienced for at least twenty-five years.

Respecting rainfall, we find that rain fell on twenty-four days fewer than the average, and that the amount which fell was less than the average in every month, excepting August and November. In January, June, and July, it was about half, and in October it was less than half, while in February it was only one-third of the average.

The total rainfall for the year was 20 per cent. below the average. For some of the midland and south-western counties, and for parts of Ireland, the year 1887 was the driest on record.

In the neighbourhood of London the number of warm and very warm days was the smallest we have experienced for eight years. The number of cool days exceeded any year since 1879, and to find an equally great number of frosty nights we must go back at least twenty-five years. Owing to the deficient temperature having occurred mostly in the spring and summer months, the death-rate from diseases of the respiratory organs was not abnormally low.

The two features of the most striking interest in the meteorology of last winter were the great gale on the 8th and 9th of December, 1886, and the heavy snowstorms in the south of England on the 26th of the same month. During the gale on the 9th of December, the barometer sank in London to 28·30, the lowest level recorded in the Metropolis for forty-five years.

Over the greater part of England, including London, the spring was the coldest on record.

The summer of 1887 was remarkable for its brilliancy. From the 5th of June to the middle of August there was an almost unprecedented drought. Long spells of heat were experienced in London during July and August. The amount of bright sunshine recorded at Greenwich was greater than in most years, and nearly double that of the summer of 1879.

The autumn of 1887 was cold, changeable and unsettled. Snow fell as early as the 10th of October. The mean temperature was greatly below the average in England, but not in Scotland.

The rainfall in the autumn was less than the average in most places, the deficiency in London being 7 per cent.

The present winter, so far, has been very changeable and unsettled. There have been no very severe

frosts in England, but on the Continent the cold just at the end of December has been intense. Since then we have had high winds, rains, and several alternations of temperature.

At the Royal Observatory, Greenwich, the highest reading of the barometer for the week ending 17th December, was 29·95 in. on Monday morning, and the lowest 29·13 in. on Thursday morning. The mean temperature of the air was 40·7 deg., and 0·2 deg. above the average. The general direction of the wind was south-westerly. Rain fell on six days of the week, to the aggregate amount of 0·81 of an inch. The duration of registered bright sunshine in the week was 5·8 hours against 5·3 hours at Glynde-place, Lewes.

For the week ending 24th December, the lowest reading of the barometer was 29·34 in. on Monday morning, and the highest 29·88 in. on Thursday evening. The mean temperature of the air was 34·9 deg., and 4·7 deg. below the average. The general direction of the wind was north-westerly. Rain or melted snow was measured on four days of the week, to the aggregate amount of 0·17 of an inch. The duration of registered bright sunshine in the week was 1·9 hour, against 5·7 hours at Glynde-place, Lewes.

For the week ending 31st December, the lowest reading of the barometer was 29·65 in. on Sunday evening, and the highest 30·07 in. on Friday evening. The mean temperature of the air was 32·1 deg., and 6·7 deg. below the average. The general direction of the wind was north. Rain fell on two days of the week, to the aggregate amount of 0·02 of an inch. The duration of registered bright sunshine in the week was 6·2 hours, against 11·1 hours at Glynde Place, Lewes.

For the week ending 7th January, 1888, the lowest reading of the barometer was 29·15 in. on Monday afternoon, and the highest 30·26 in. at the end of the week. The mean temperature of the air was 40·2 deg., and 2·4 deg. above the average. The general direction of the wind was southerly. Rain fell on five days of the week, to the aggregate amount of 0·40 of an inch. The duration of registered bright sunshine in the week was 4·1 hours, against 4·5 hours at Glynde-place, Lewes.

In February the temperature remains as in January near the Land's End, but North and East it is higher than in January, the average in London being nearly 2 deg. warmer. The average for the Land's End is 45 deg.; for Devonport, 44 deg.; Exeter, 43; Portsmouth, 42 deg.; on a line drawn from Liverpool to London, 41 deg.; and from the Solway Firth to the East Coast at Norfolk and Suffolk 40 deg.

The average rainfall for February is 1 inch on the East Coast, 2 inches on the South Coast, 3 inches on the greater part of the West Coast, and from 4 to 5 inches inland at Dartmoor, and in some parts of North Wales.

UNRECORDED DAPHNIA.

I SEND herewith a drawing of a Daphnia—found in the autumn of last year in a pond near Rye

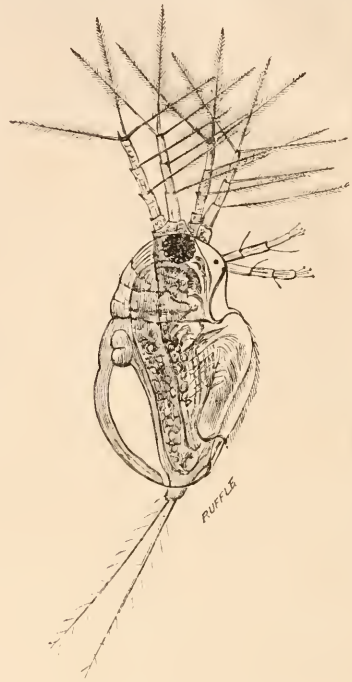

Fig. 19.—Side view of Daphnia.

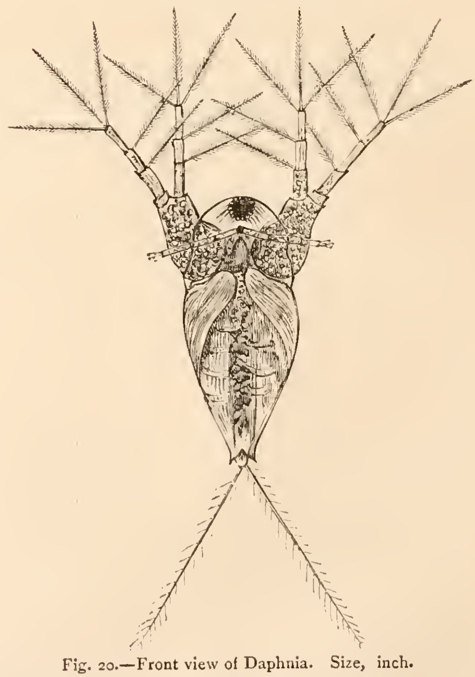

Fig. 20.—Front view of Daphnia. Size, inch.

House, of which I can find no mention in any of the

books available to me, and which I think is unrecorded, at least in England—in the hope that some one better acquainted with this family may be able to name it.

It will be observed that it has five filaments to each of the branches of the inferior or swimming antennæ, and belongs therefore probably to a genus other than Daphnia. The superior antennæ are long and apparently three-jointed; the large single eye is accompanied by a black spot in front of it. Its mode of swimming is in long jerks, resembling more *Tida crystalina* in this respect than the common Daphnia. The internal organs appear to be normal. I have seen a number of individuals, but they were by no means plentiful. Size of body, $\frac{1}{16}$ inch.

C. ROUSSELET.

SCIENCE-GOSSIP.

A COMPLETE history of the Vertebrates of Leicestershire and Rutlandshire will shortly appear, compiled from notes by Dr. Macaulay and others, and edited by Mr. Montague Browne, of the Leicester Museum. The Rutlandshire part will be edited by Lord Gainsborough.

THE Rev. A. C. Waghorne is publishing a series of excellent papers in "The Colonist" on "The Berries and Fruits of Newfoundland."

MR. FRANCIS GALTON has delivered three important lectures at South Kensington on "Heredity and Nurture."

A LECTURE was recently delivered by Mr. W. August Carter, of the National Fish Culture Association, at Foresters' Hall, Forest Hill, upon the "Denizens of the Aqueous Kingdom." After comparing the habits and instincts of fish with terrestrial animals, the lecturer commented upon the question of migration, and considered that we ought not to attribute the cause of fishing grounds being depleted to the temporary absence of migratory fish. The barren condition of many fishing grounds was due to over-fishing and the devastation wrought in reaping the products of the ocean. The question of migration was a mysterious one, but probably it would be found that fish merely alternated their movements between their spawning and feeding grounds. He considered it was high time that the Government supported a system of fish culture, not only in regard to fluviatile but also marine forms; also a system for providing technical education to fishermen.

DR. F. P. VENABLES has given in the "Chemical News," the results of a series of experiments on the degree of dilution at which different substances can be tasted. Known weights of the substances were dissolved in water, diluted to known extents with water, and one cubic centimetre of the solution was tasted by each of two persons. The results were:—sugar, three ten-thousandths of a gramme barely tasted; salt, one-thousandth barely tasted; tannin, two ten-thousandths tasted, one ten-thousandth failed to taste; hydrochloric acid, one ten-thousandth barely tasted; strychnine, one two-millionth barely tasted. Thus the sensitiveness of taste is inferior to that of smell.

THE monks of St. Bernard have established the highest-lying telephone connection in Europe, in order to facilitate their famous work of charity. Their well-known hospice is now in telephonic communication with the towns of Proz and St. Pierre in Switzerland and those of Fontine and St. Remy, on the Italian side of the mountain.

THE borings now being carried on in the Nile Delta by the Royal Society have been temporarily stopped by the breaking of the pipe. The depth reached is over 324 ft., but no solid rock has been arrived at.

EXPERIMENTS have been recently made in St. Petersburg with the idea of slaughtering cattle by electricity, the results of which have been highly satisfactory—death being in all cases instantaneous.

THE Selborne Society has issued the first monthly part of the "Selborne Magazine," as the accredited organ of their society.

WE are sorry to record the death of Professor Balfour Stewart, of Victoria University, Manchester, at the comparatively early age of 59.

THE name of the "Youth Library and Scientific Society" has been changed to that of the "Universal Society of Science, Literature, and Art," and its official organ henceforth will be the "Junior Review," a copy of which we have received, and which promises well. The fifth annual meeting was held on the 10th ult. at Exeter Hall. We wish the Society every deserved success.

A GENERAL MEETING of the "Practical Naturalists' Society" was lately held in London, where the Society was judiciously strengthened by the reconstruction of some departments. Full details of the meeting appear in the pages of the "Garner" for January.

PECULIAR SUNFLOWERS.—No. 1 had its outer row of florets, tubular instead of ligulate; each floret was about one inch long, with five teeth and a slit about half-way down one side. The flower head of No. 2 had its centre occupied by a number of involucral bracts, with a ring of ligulate florets surrounding them, giving the flower a most curious appearance.—*J. E. C.*

MICROSCOPY.

The "Journal of Morphology."—It is singular how long American morphologists have been content to send many of their memoirs to England for publication, from the want of an authoritative journal, dealing specially with Morphology, in their own country. Several such magazines have been started from time to time in the United States, which were fondly expected to play the same part there that the "Quarterly Journal of Microscopical Science" does in England, but all lamentably failed. Their editors did not succeed in gaining the confidence and support of the best American workers. A new venture has just appeared, under the title of the "Journal of Morphology," and the first number is now before us. It is edited by Mr. L. O. Whitman, the prestige of whose name will go far to ensure its success, and the seven memoirs included in its first issue are remarkable both for the importance of the subjects and from the fact, that they are contributed by men who stand in the first rank of American science. The plates and style of printing are of that high class familiar to readers of the English journal. The English agent is Mr. W. P. Collins, 157 Great Portland Street, London.

Microscopical Society of Calcutta.—An interesting meeting of the Microscopical Society of Calcutta was held on the 5th of December last, when Mr. H. H. Anderson read a paper on a new Infusorian discovered by him. It is parasitic in the alimentary canal of *Æolosoma chlorostictum*, W. M. mss., and has been named *Anoplophrya æolosomatis.* In some cases seven or eight of the parasites have been found in a single worm. The Infusorian sometimes disintegrates while under observation in a curious way, releasing a swarm of ciliated cells. It divides by fusion, and in some instances two septa have formed in a single organism. At the same meeting, Mr. E. J. Jones, A.R.S.M., described some nodular stones which have recently been dredged up off Colombo, in the island of Ceylon, from a depth of 625 fathoms. They possess a specific gravity of 3·77, and it was supposed their great weight was due to an excess of manganese, as was the case in the nodules of the "Challenger" expedition. Only a small trace of manganese is, however, present; but as much as 75 per cent. of sulphate of barium is found. Sections made for microscopic examination indicate a volcanic origin. The spherulites show black crosses, with the nicols crossed; and when the prisms are rotated, the orientation of the crosses remains fixed. The sections also show indications of foraminiferæ, though from the crystalline texture of the nodules, it is clear they have been subjected to great heat.—*A. E. Simmons.*

ZOOLOGY.

Scarcity of V. Atalanta in 1887.—My experience with regard to the scarcity of *V. atalanta* during the past season coincides exactly with that of your correspondent, R. B. P. In the country round Malvern, where I spent August and September, and where Atalanta is usually common enough, I only saw one specimen at the end of August.—*A. G. Tansley.*

Odostomias at Herm.—During a visit to the Channel Isles in September last, I took the following species of Odostomia at Herm:—*O. unidentata*, Mont., of occasional occurrence; *O. dolioliformis*, Jeff., a single specimen; *O. spiralis*, Mont., common; *O. fenestrata*, Forbes, one beautiful specimen—this species is recorded for Jersey only by Dr. Jeffreys; *O. scalaris*, Ph., of occasional occurrence; *O. lactea*, L., common; *O. acicula*, Ph., rare. I may also mention amongst the Rissoids that occurred to me this year in Herm, the following: *striatula*, Mont., *lactea*, Mich., *cancellata*, da C., *calathus*, F. and H., *reticulata*, Mont., *Zetlandica*, Mont., *violacea*, Des M., *costulata*, Ald., *punctura*, Mont., and *semistriata*, Mont.—*B. Tomlin.*

Insects, &c., at Gibraltar.—Mr. James J. Walker contributed to the "Entomologists' Magazine" a paper on "A Year's Insect-Hunting at Gibraltar;" it appears that the insects that swarm about the rock are of wonderful interest. There is scarcely a day throughout the year on which butterflies may not be found, and Mr. Walker enumerates fifty-five species for the limited district, thirty of which have occurred on the rock itself. He has found nine hundred species of beetles, and is daily adding to the number. The rock is the sole European locality in which the Barbary ape is found in a wild state. These animals, reduced a few years ago to less than a dozen individuals, have of late greatly increased in numbers, and, being strictly protected, are very bold and fearless. The fig-trees in the gardens suffer so much from their depredations when the fruit is ripening that it is found necessary to employ men to scare them away. The Barbary partridge, though numerous on the rock, as well as on the opposite African coast, is, like the monkey, found nowhere else on the European continent.

Mr. William Burgess, proprietor of the Midland Counties Fish Culture Establishment, states that a pond constructed by him last March, measuring fifty feet by thirty feet, which was entirely isolated from other similar ponds, was shortly after its formation found to be populated with trout fry in their alevin stage. No fish of any kind had been placed in the pond, and none could have entered it, the inlet and

outlet being blocked with perforated zinc of a very fine mesh. The soil of the pond in question was excavated from a brook where trout must have previously spawned, and the ova although buried in mud and flung heedlessly about, survived, and the fry came to life when water had been let into the pond. This is another proof of the enduring capacity of Salmonidæ ova.

AUTUMNAL MIGRATION OF BIRDS.—An article appears in the January number of the "Zoologist," by Mr. Allan Ellison, on the "Autumnal Migration of Birds in Ireland." Mr. Ellison says that the migration movement of last autumn in Ireland was in all respects a most exceptional one. Some of the migrants appeared unusually early, and all in much larger numbers than he had ever before observed. On October 8th he saw the first flocks, both starlings and redwings. On the same day, and for about a week after, immense numbers of golden plovers were passing over, flying towards the west and south-west in large V-shaped strings. This was about the usual time for starlings and redwings, but early for golden plover. On the 11th, again, both redwings and starlings were constantly passing. On the 16th, he observed a great host of fieldfares, many thousands in number, winging their way across the sky towards the south-west. From October 17th to the beginning of November, the starling migration was at its height, the flocks being much larger and more numerous than he had ever observed in former years. He saw within a quarter of an hour on the afternoon of the 18th. At 4 P.M. on the 22nd the largest flock he ever saw passed over. It was in the form of a column, perhaps nearly a mile long, and must have numbered thousands, spanning the sky from horizon to horizon, for more than half a minute, and was followed in a short time by two smaller flocks. All the latter part of October skylarks were from time to time flying over, generally large straggling flocks or scattered individuals, flying nearly out of sight, but their call-note being distinctly audible. Mr. Ellison hopes that those who are favourably situated for observing the arrival of winter birds will report whether they have noticed a corresponding abundance of migrants this season.

ANIMAL PSYCHOLOGY.

MISTER PUP.—She is a staid lady of seven years, but such is her name, is a half-bred Bedlington, of undeniable mental acuteness, which is proved, I think, by the following acquired habit. She always drinks from a saucer placed beneath the stone filter in a corner of the dining-room. Finding the saucer frequently empty, she has learned to turn the tap for herself by licking vigorously. She has taught another dog the same habit, but, unfortunately, they forget to turn the water off when thirst is assuaged; consequently a pool too often stands on the carpet. A new and firm tap has had to be placed on the filter, much to Mister Pup's indignation and wrath.

SHAG AND GULL.—Mr. Winwood Reade, in his "Martyrdom of Man," speaking of morality in animals, says: "If they have human virtues, they also certainly have human vices." The following incident, vouched for by a scientific friend of mine in Guernsey, shows that some of our feathered friends are about on a par with humanity, in, at least, the matter of "*lex talionis*." Near Guernsey harbour, a few days ago, a shag (*Cormoranus cristatus*) was diving for smelts, which, when captured, he came to the surface to dispose of. Having caught one that was too large to bolt, he cut it in halves, and while he was swallowing the first of these, a gull, that was swimming near by, "annexed" the other. The shag, after a moment's deliberation, commenced proceedings in swordfish *versus* whale fashion; taking a dive, he came up with great force below the gull, giving it such a thrust with his strong bill as to knock it right out of the water, following up the onslaught by seizing the gull's leg, and for some seconds striving hard to drag the loudly expostulating, or, perhaps, apologising, culprit under the surface. Instinct?—*J. Sinel.*

BOTANY.

CAMPANULA GLOMERATA AND GENTIANA CAMPESTRIS.—The note by R. B. P. on these plants on page 21 of January SCIENCE-GOSSIP, must be my excuse for mentioning the fact, that the former plant is frequent in S. Beds, on the chalk hills, and often assumes the unifloral diminutive form described by your correspondent as characterising it on Beachy Head. The *Gentiana campestris* does not appear to grow in S. Beds, at least, I have searched for it diligently for six or seven years, but without success. *Gentiana amarella* is abundant here, and it frequently occurs with tetramerous flowers, so that at first sight it is easy to mistake it for *G. campestris:* in fact, the numerical arrangement of the floral organs is of little use in distinguishing the species, the only safe guide being the deeply-divided calyx of the latter. Not having ever found *G. campestris*, an exchange of specimens with R. B. P. would be acceptable to *J. Saunders, Rothesay Road, Luton.*

FLOWERS AND FRUITS.—The question put by A. G. Tansley is one which has engaged my thoughts a good deal, as I have always believed that botanists had not been happy in their choice of words to describe the relations between foliar and floral organs. On reading that a leaf is much more highly organised than a petal, it is well to remember that a petal is not an essential organ; that is, not an organ of repro-

duction. That the uppermost leaves on a stem should be starved, aborted, or degraded is not indeed what one would expect, considering that leaves are organs of nutrition each of which makes the plant that bears it richer as it grows. Look at a young plant of the scarlet-runner, the second pair of leaves is larger than the first. So it is with peas and other plants raised from seed, that the leaves are larger as they are increased in number, the later leaves having an advantage in the nutriment elaborated by those that came before. We might therefore expect that a plant having no definite limit to its power of growth, an exogenous tree, would go on lengthening upwards till it should reach the height at which its leaves would be starved by reason of the rarefaction of the atmosphere. Such however is not found to be the case. The length of a branch bearing leaves is evidently determined by some other principle than the nourishment which the leaves afford and which is not all spent in provision for the leaves which come immediately after, but stored up in bulb, come, tuber or rhizome, or it may be in a woody stem. Thus it is that the upper leaves upon a stem may be starved, aborted, or degraded at the same time that the plant is laying up a store of nourishment. This procedure of a plant may be compared to the conduct of a man whose bodily strength is exhausted by work till he is no longer able to stand up long enough to earn fourpence by manual labour, but who has laid up so much of what he had already earned as to have capital at his disposal which he may use to gain a profit. By such an expenditure of capital, a plant produces flowers, fruit, and seed, as we may sometimes notice in an old apple-tree covered with blossom and afterwards with fruit though so weak from age that it can hardly form a leafy twig as long as your little finger.—*John Gibbs.*

DIELYTRA SPECTABILIS.—As the naturalisation of foreign species ought always to be placed on record, it may be mentioned that near Coates, Sussex, this pretty flower, doubtless a garden outcast, has become well established during the last few years in woods in the neighbourhood, and will doubtless attract the attention of future observers. It may also be noted that, both as to foliage and flowers, it has so deteriorated that it has a very different aspect from the cultivated plant. Like other of the Fumariaceæ, such as *Corydalis lutea*, it may possibly become a recognised alien in our flora.—*F. H. Arnold.*

RAPHIDES.—At a recent meeting of the Jena Naturalists' Society, Prof. Saahl read a paper on the meaning of those excreta of plants called Raphides, i.e. crystalline needles often found in the cells in large quantity. From experiment he inferred that they were a protection to plants against being eaten by animals. Many animals avoid plants with raphides, or eat them reluctantly; and some animal, e.g. snail species, in eating plants that have raphides select those parts that are without the crystals. Many plants held for poisonous, e.g. *Arum maculatum*, owe their burning taste simply to the very numerous raphides, which, forced out of their cells, enter the tongue and palate. The juice obtained by filtration has quite a mild taste.

GEOLOGY, &c.

THE DISCOVERY OF A GIGANTIC TURTLE BY DR. DONNEZAN.—This specimen was found, with numerous other fossils, in the middle Pliocene of Perpignan during the recent excavations connected with the erection of the fortress of Serrat in the Eastern Pyrenees. The carapace, 1·20 metre long, was extracted with great difficulty from the hard rock in which it was completely imbedded, the innumerable fragments being carefully put together by Dr. Donnezan, by means of about a thousand brackets. This turtle, which he has presented to the Paris Museum, considerably exceeds its living congeners, being equal in size to the *T. grandidier*, a sub-fossil species found in Madagascar. Its survival down to the close of the Middle Pliocene is important for the study of the glacial period, tending to show that the South of France even then still enjoyed a warm climate.

THE CORRELATION OF SOME OF THE EOCENE STRATA IN THE TERTIARY BASINS OF ENGLAND, BELGIUM, AND THE NORTH OF FRANCE.—Prof. Joseph Prestwich has recently read a paper on this subject before the Geological Society. Although the relations of the several series have been for the most part established, there are still differences of opinion as to the exact relation of the Sable de Bracheux and of the Soissonnais to the English series; of the Oldhaven Beds to the Woolwich series; and of the London Clay and Lower and Upper Bagshots to equivalent strata in the Paris basin. The author referred to the usual classification of the Eocene Series, and proceeded to deal with each group in ascending order. The Calcaire de Mons is not represented in England, but may be in France by the Strontianiferous marls of Meudon. It contains a rich molluscan fauna, including 300 species of Gasteropods, many of which are peculiar, but all the genera are Tertiary forms. The Heersian are beds of local occurrence, and Prof. Prestwich sees no good reason for separating them from the Lower Landenian or Thanet Sands. He gave reasons for excluding the Sands of Bracheux from this group. Out of twenty-eight Pegwell-bay species, ten are common to the Lower Landenian, and five to the Bracheux Sands, which present a marked analogy with the Woolwich Series. These Sands of Bracheux are replaced in the neighbourhood of Paris

by red and mottled clays. Out of forty-five species at Beauvais only six are common to the Thanet Sands and ten to the Woolwich Series. Out of seventy-five species in the Woolwich and Reading Beds nineteen occur in the Bracheux Beds, if we add to these latter the Sands of Châlons-sur-Vesles. Respecting the Basement Bed of the London Clay (Oldhaven Beds in part), Prof. Prestwich would exclude the Sundridge and Charlton fossils, which should be placed on a level with the Upper Marine Beds of Woolwich. He allowed that the former were deposited on an eroded surface, but this involves no real unconformity, whilst the palæontological evidence is in favour of this view, since out of fifty-seven species in the Sundridge and associated beds, only sixteen are common to the London Clay. He therefore objected to the quadruple division. Either the Oldhaven should go with the Woolwich or with the Basement Bed. He admitted that the term "Basement Bed" is objectionable, and preferred Mr. Whitaker's term for the series, as he would limit it. The Lower Bagshot Sands, Prof. Prestwich would call "London Sands," whose Belgian equivalent is the Upper Ypresian, and the French the Sands of Cuise-la-Motte, forming the uppermost series of the Lower Eocene. A group of fossils has been discovered in the Upper Ypresian sands of Belgium, which leaves no doubt of their being of Lower Eocene age, and consequently the Lower Bagshots must be placed upon the same horizon. There is no separating line of erosion between the London Clay and the Lower Bagshots, the upper part of the former is sandy, and the lower part of the latter frequently argillaceous. Similarly no definite line can be drawn between the Upper and Lower Ypresian; but in both countries this series is separated from overlying beds by a well-marked line of erosion. So also in France the base of the Calcaire Grossier (Bracklesham Beds) is a pebbly greensand resting on an eroded surface of the Sands of the Cuise-de-la-Motte. In Belgium, in Whitecliff Bay, and in the Bagshot district the Upper Eocene rests upon an eroded surface of the Lower Eocene.

NOTES AND QUERIES.

Green Tree Frogs.—While staying at Mentone some eighteen months ago, I sent a parcel, containing twelve or fourteen green tree-frogs, to a friend in Brighton who wished to see some, as he had heard a great deal about them; but, on their arrival, not knowing what to do, as they were so lively after their journey, he released some in the garden among the shrubs, but from that moment he saw no more of them; the remainder he gave to two friends to keep in their greenhouses. A few weeks after, I happened to be at his house, when he told me that he had searched everywhere, but could find no signs of the frogs which he had liberated, and in the course of conversation informed me that his next-door neighbour had a duck, which quacked in a very peculiar manner, different to any that he had ever heard before. On his mentioning this, I suspected that, instead of a duck, it was one of the frogs which had clambered over the wall, and taken up his quarters there. Later on, my attention was called to the sound, which, on being localised, was found to proceed from the upper part of a large bush growing against the wall, but no frog could be found, the foliage being so thick. During the summer months, the frogs strayed from garden to garden of an evening after sunset, or whenever it came on to rain: one would commence croaking, and directly afterwards another would answer from perhaps six or eight gardens away, and then a third, until it almost reminded me of an evening in the Riviera. When the cold weather commenced, they evidently perished, for they were heard no more. Wishing to study a little the habits of these most interesting creatures, I obtained (some sixteen months ago) eleven from the same locality, which I placed in a small fern-case; they seemed to like their quarters much, especially one corner which I arranged to form a pool of mud; but, as regards feeding them, they disposed of blow-flies, houseflies, spiders, or, in fact, any insect which showed signs of life—dead ones they would never touch—in such quantities that they seemed to be never satisfied, their favourite diet apparently being blow-flies, bees or wasps, the stings not disturbing them in the least, and the more they buzz the better they like them. During the winter three of the smallest died, and the surviving eight, evidently owing to the liberal supply of food, have grown considerably. It is astonishing, considering the size of them, what a quantity they can manage to eat or rather swallow. I have seen them tackle and successfully put out of sight, three and four large cockroaches, legs, elytra, and all, and then quietly retire to some obscure corner to go to sleep for a week or ten days, and digest their hearty meal. Since their confinement, they have become very tame, and afford an endless source of amusement to my friends, who, when they happen to hear one croak, express their astonishment that such small creatures should be able to produce a sound almost as loud as a duck. The approach of winter is already very perceptible in their behaviour; they are very sleepy, and have but little appetite for the dainties with which I tempt them, soon they will search out secluded corners, and prepare for their winter sleep.—*M. R.*

The Term "Rudimentary" as used by Darwin.—The writer of the article on this subject resents in strong terms the use which Mr. Darwin makes of the term "rudimentary" in his "Descent of Man," as an insult to the human race. I cannot help thinking that this is rather far fetched, and surely it is far better, and requires no very great stretch of generosity or magnanimity to look in this case more to the spirit than the letter. No one of

course will deny that the strict and literal sense of the word "rudimentary" is "rude and unwrought" or undeveloped, but it is equally certain that Darwin would have been the last man in the world to tell us that our organs have never reached perfection. So far from leaving me "impressed with the appalling fact that, after all, our much-admired human form, with its boasted superiority, is but a bundle of rudimentary organs, which have never reached perfection," the works of Darwin teach me in a most unmistakable manner that we are so wonderfully made that our organs are in the highest state of perfection for the existing circumstances, and that we are so constructed that when the conditions alter, our organs do likewise, and thus we remain perfectly adapted to our surroundings, and this should immeasurably increase one's awe of the Power which, in the first instance, created a creature at once suited, admirably suited, to the conditions by which our primæval ancestors were surrounded, provided with the means of bettering his condition and of raising himself to a high state of civilisation, and at the same time enabled to adapt his organs to this higher environment. Surrounded as they were by all sorts of wild animals with whom they were compelled to fight for life and for food, it was essential that the senses of sight, smell, and hearing, should be highly developed in our ancestors; but in this nineteenth century we no longer require such keen perception in these lines, and our senses are consequently modified: on the other hand, the brain which in primitive man was probably less complicated than nowadays, has reached a much more complex stage of development to suit the altered conditions, when men fight in the struggle for existence with their heads instead of their limbs; and this higher state of development in the brain must react on the senses in a manner immensely advantageous when considered in relation to the environment; thus, though we can no longer hear sounds, which were clearly audible to our primitive ancestors, we are enabled to diagnose the sounds we do hear, and appreciate beauties in music to which the savage is still dead. Surely we owe too much to the great name of Charles Darwin—to the man who revolutionised modern science, and set things on a firm, because true, basis, to the man who devoted his whole life to the discovery of truth, in the face of enormous difficulties, who would cheerfully have given up his pet theories one by one, could any one have convinced him that they were false; surely, I say, we owe too much to him to accuse him of offering an insult to the human race because his use of the word rudimentary is not sufficiently flattering to our dignity or our pride. That our senses of hearing, etc., are comparatively rudimentary in some ways to what they once were is to me beyond doubt, nor can I doubt that it is best so, or that what we lose—if it can be called a loss—in one direction, we gain a hundredfold in another. But, since the desire to have the word altered seems to exist, and since the alternative offered—viz. vestiges—does not meet with approval, may I venture to suggest that the word "modified" be mentally substituted when the word "rudimentary" is found to be objectionable. I cannot however believe for one moment that primitive man was made up of "excrescences and deficiencies;" and to hint even that "abnormal" development of the organs of sight or anything else exists as a rule in nature is to me illogical, and more insulting to the dignity of the Creator than is Darwin's application of the word "rudimentary" to our organs to the dignity of the creature that was made in the image of God.—*T. Alfred Dymes.*

RUDIMENTS AND VESTIGES.—A writer in your last number seems to take somewhat vehement exception to Mr. Darwin's term of "rudimentary," as applied to certain structures found in the human body, and deems it a slight upon mankind to speak of "vestiges." I confess I cannot see where the objection lies. In speaking of structures as "rudimentary," we use the term in comparison with structures of the same kind in a higher state of development. For example, the "down" covering a man's body is certainly in a more rudimentary condition as regards the hair on the lower animals, which is in a more advanced stage of development. Again, if we grant that man is descended from some lower form, the external ear and its muscles are but "vestiges" of the earlier form, which has gradually atrophied and become changed, as it was no longer necessary. We cannot say that they are in a higher stage of development, as the highest development of the sense of hearing is found in the lower animals. Then why is it not right to call them "vestiges," they are but the altered remains of our progenitors, and are undoubtedly in a "rudimentary" condition compared with the highest standard? As for the *os coccyx* being a rudimentary tail, I imagine that most people sit down under the insult, with the greatest composure, and I do not see anything more comforting to the mind, or more correct in science, in calling it an "excrescence." The teeth and jaws of the ape are surely superior to man in strength and biting power, and these are their only use, and I can see no reason why these structures in man should not be considered vestiges, and to be in a rudimentary condition as compared with the ape. Why should these structures be called *abnormal* in the ape? They are perfectly natural and necessary. We might just as well say that man has an abnormal amount of brain, which would spoil the idea of harmony which exists to perfection, in every organism? In every animal we look at, we find that all its organs are beautifully adapted to perform their various functions, and make up a harmonious whole. It is only the natural conceit of man that causes him to consider certain structures in the lower animals as unsightly. He compares them with his own, but looked at with regard to their anatomy, &c., they become beautiful. There is nothing in anything that Mr. Darwin has said, which must not strike us with increased awe and admiration for the marvellous changes and developments which Nature has brought about.—*G. D. Trevor-Roper, Surgeon, R.N.*

FOX EGGARS.—I have got some fox eggars, which I have had since the beginning of September. I have been feeding them on bramble; now they have stopped eating it, and lie curled up in the bottom of the box. Could you tell me if they are hibernating, or if some disease has attacked them?

NEST OF AUSTRALIAN FLY (p. 239).—From the particulars given by Mr. Browne's friend, it is impossible to identify this insect. I have little doubt, however, that it has four wings (flies have only two), and that it is one of the fossorial hymenoptera. Many of the English species, especially those of the genera Pompilus and Crabro, provision their cells with spiders. Some store up for their young other insects, such as flies, aphides, beetles, and lepidopterous larvæ. Towards the end of July last, I came across a large colony of *Cerceris arenaria*, near Weybridge, and it was interesting to watch the females arriving on the wing at, and entering their burrows on the upright face of a sandbank, each carrying between her legs a beetle, always the same

species, *Stiorhynchus sulcatus*, one of the weevils, and forthwith depositing it within as food for the larvæ to be born from the eggs of the cerceris. On opening a burrow, moreover, there was a cluster of twenty or more beetles, neatly packed, each beetle being paralysed by the sting of the cerceris, and, while thus prevented from moving, still alive, so as to afford fresh food for the larvæ, as and when required. Again, in August, I met with numbers of *Odynerus spinipes* busy at a colony they had formed on the face of a cliff at Swanage, each female frequently arriving with a small green lepidopterous larva, with which it clambered up the curved mud funnel, forming the entrance to the cell, adding it to the heap of similar larvæ which were found on opening a nest. Altogether the habits of this group of insects are very interesting, and are well worth investigation.—*H. Ramsden.*

Ornithological Voracity.—On the 28th of November, Mr. Thomas Whitfield had the peculiar luck to find a dead kingfisher on the banks of the stream in Weasdale. Strange to say, it had apparently been choked in the action of swallowing a bull-head, the latter part of whose body was hanging out of its mandibles.—*Thos. Hewetson, The Lane, Weasdale, Ravenstonedale, Westmoreland.*

Albino Rook.—This bird was shot at Newport, Monmouthshire, it being pure white or cream colour.—*William Shakespeare, Naturalist, Cardiff.*

Bees and Lime-trees.—Your correspondent on this subject in last month's issue of Science-Gossip is quite correct in thinking that the juices contained in the flowers of the lime-tree (*Tilia Europæa*) are possessed of poisonous properties, which prove fatal to bees that frequent this tree when in bloom. Hive-bees, humble-bees, and even wasps provide innumerable victims to the intoxicating poison which they so eagerly imbibe from the flowers of the lime, and the numbers of dead insects which strew the ground underneath the trees testify to the fatal nature of the nectar which they imbibe. Some of them, after falling to the ground in an intoxicated manner, may escape the utmost consequences of their death-dealing repast, but to the great majority of them a short carouse amongst the blossoms proves fatal. I have not noticed that the thorax of the poisoned insect has been scooped out, but I have often found the head, thorax, and part of the body—one part of the body being gone, and the other part having the inside apparently scooped out. This I set down as being due to the dead insects having been blown about by the wind, the body, which soon gets to be stiff and dry, being easily broken at one of the joints. Then the spiders and earwigs take possession of the cavity.—*J. Bowman, Havelock House, Sunderland.*

Names of Fishes.—Could any one tell me what is the correct name of a fish, of the carp species, having an arched back like a bream, but the true carp dorsal fin and plumpness of body; the back a darkish colour, and the sides a beautiful gold, and a silvery gold lower, but when not catching the light, of a bronzy colour? Could this be the fish mentioned in Shirley Hibberd's "Fresh-Water Aquarium," as the Crucian or German Carp (*Cyprinus carrassius*), of which he says, it "is easily distinguished from its compeers by its bream-shaped back, which rises from the nape into a high arch along the line of the dorsal fin. It is found in the Thames between Hammersmith and Windsor," etc. And also what is the name of another carp, back dark, slightly tinged with dark red, and two reddish marks on the head, and the sides of a very brilliant gold bronze, and preserving the true carp outline and fins? Also of one exactly like the last, but without any red tinge; and another the same as that but having the dorsal fin on the centre of the back, like a tench's?—*A. G. Whishaw.*

Convolvulus Hawk Moth.—On August 31st last, I had a very fine specimen of the convolvulus hawk moth brought to me alive; the wings were slightly rubbed. It is the first living specimen I have met with, but some years ago a woman showed me a chrysalis, which, from the projecting proboscis, something like the handle of a pitcher, and its large size, I believe was the chrysalis of this moth.—*C. F. George.*

Cuckoo.—In answer to Mr. Wallis's question in November "Gossip," whether I really saw the bird, I can assure him it was even as I stated in my previous note. I saw the bird, and saw the movement of the throat during the utterance of the sounds, and the bird flew away still crying cuckoo-koo. I have frequently heard the bird since in the same locality uttering the same three syllables.—*F. J. George, Chorley, Lanc.*

Cuckoo's-Mate.—Mr. W. E. Windus says (page 259) of the wry-neck (*Yunx Torquilla*): "It is, I should think, of insectivorous habits." I find that Gilbert White, of Selborne, says of it in his "Observations on Birds:" "These birds appear on the grass plots and walks. They walk a little as well as hop, and thrust their bills into the turf, in quest, I conclude, of ants, which are their food. While they hold their bills in the grass, they draw out their prey with their tongues, which are so long as to be coiled round their heads."—*Thomas Winder, C.E., Sheffield.*

Feeding Frogs and Newts.—In "Notes and Queries" for October, a correspondent asks for information respecting the feeding of the above. During the summer months, I give my little batrachians a plentiful supply of small insects, caterpillars, house and meat-flies and their larvæ, and small garden worms. For winter's use, I always keep a number of the latter in earth in flower-pots or boxes, so as to be able to feed my pets when hungry, and when food outside is not easy to obtain. It is a common mistake to keep newts continually in water as if they were fish and not amphibians. I have a number of newts, salamanders, and green-tree frogs in a large fern-case, with a small earthenware pan for water, to be used as a bath. By paying attention to their habits, and giving them a constant supply of food, I have been able to keep some of my newts in captivity for four and five years. My warty newts are very partial to raw beef cut into small shreds, but the smaller species and the frogs will seldom touch it. The latter are especially fond of small earth-worms (and the warty newts also), and it is very amusing to watch the antics of froggie busily engaged in swallowing a worm, in which proceeding he is greatly assisted by his fore-feet, which are used to brush away the superfluous earth, and to stow the ends of the worm quickly and snugly into his mouth.—*A. J. Jenkins, New Cross.*

Educational Collections of Insects.—It may interest Mr. Bath to know that, in conjunction with Professor Westwood, I have had the honour to fit up

such a collection as he names (S.-G. p. 253) for the Agricultural Department at S. Kensington. I have also fitted up collections on somewhat different lines for the Royal Gardens, Kew; Liverpool Free Museum, and other places, and am now appointed by the S. Kensington authorities to fit up collections for any institution receiving government support, that may require them.—*S. L. Mosley, Beaumont Park Museum, Huddersfield.*

SPHINX CONVOLVULI.—This fine species seems to have been not uncommon in the neighbourhood of Birmingham last season. I have heard of three captures, one in Moseley, and the others in adjoining parishes.—*K. D., Cofton.*

TEMMINCK'S STINT.—During the autumn migration a specimen of this bird was shot on the edge of a large piece of water in this part of Worcestershire. —*K. D., Cofton.*

THE IVY.—It appears to me that Mr. Williams has wandered a little from the point in his reply (p. 257) to C. C.'s remarks (p. 236), the case of the flower-stem which he quotes not being quite a parallel one. The stem of the flower is the channel through which it receives its main nourishment, and is equivalent to the main stem of the ivy, whereas the rootlet of the ivy is evidently *not* the main channel of its nourishment, but only at best a minor one, if even that. It does not follow that C. C. is correct, however. Cut through the main ground-root of the ivy, and the plant dies, as he remarks; but this does not at all prove that the rootlet conveys no nourishment or moisture whatever to the plant. I take it the chief function of the rootlet is similar to that filled by the tendril of the pea, viz. to cling. Most walls are more or less damp externally, and that being so, why should not the rootlet in course of time evolve some process by which it could absorb this ready-to-hand moisture, and so aid the main stem in its work of sustaining the plant? Ivied walls have had the reputation of being damp, and the question seems to be whether the damp attracts the ivy, or the ivy attracts the damp. It ought not to be difficult to ascertain whether ivied walls really are damp or not.—*F. M.*

THE SINGING OF THE KETTLE.—The explanation of this familiar phenomenon, given in SCIENCE-GOSSIP for December, pp. 275–6, by Mr. Williams, is the correct one. The air dissolved in water is expelled in boiling, and if the singing depended on the elimination of air, no recurrence of it would take place by replacing the kettle on the fire. Yet every boy who has experimented with a kettle knows how readily the kettle will sing by alternately heating and cooling the water.—*D. S.*

FLIES AND ANTS.—I shall feel much obliged if any of your readers can give me a clue as to what was going on in the incident detailed at foot hereof. I was staying at Sandown, I.W., last summer, and one Sunday afternoon (7th August), about four o'clock in the afternoon, I observed an enormous number of black ants running about all over a concrete path, up some short iron railings, and over the bed and grass adjacent to their nest. Besides the ants were a great number of a peculiar-looking fly, which I do not remember having noticed before. They were about ¼ in. long, dark sepia bodies (almost black), with the segments distinctly marked, moniliform antennæ, short plump abdomens, which did not extend to the end of the wings when the latter were folded on their backs. Their movements were slow and deliberate. The number of their wings was four, consisting of a thin transparent substance like the house-flies'. Query name? Besides those of the above-mentioned size, there were about an equal number of smaller ones, not much more than half the size of the others; but I think of the same species. Both flies and ants were running about in a distracted sort of way, and to all appearance having no object in their movements. The larger of the flies were collected at the tops of the railings, over whose rounded summits they moved in much the same manner as a bee over a ball-shaped flower. Neither flies nor ants attacked one another, but rather the reverse, for when they met both seemed to try and get out of the way of the other, and went off in different directions.—*Amator Naturæ.*

VANESSA C-ALBUM.—During September last year, this butterfly was common along the west side of the Malvern Hills. I caught several specimens during the month, but only one in August, on the 9th, which seemed as if it might be a lingering specimen of a July brood. Is it certain whether *C-album* has two distinct broods or not? I find in Newman's "British Butterflies":—"An idea seems prevalent that there are two broods in the year. . . . I think this is a mistake; I have been able to obtain no satisfactory evidence of any caterpillars prior to those so abundant in the autumn months about the season of hop-picking." Now the butterfly I caught on August 9th (and Newman admits he has seen it in June, July, and August), certainly cannot have been a hibernated specimen, or the imago of a caterpillar feeding "about the season of hop-picking." *C-album's* favourite flower seems to be bramble; indeed I tried a long while on the 20th of September after three or four which were settling on a clump of brambles. Every time I struck at one or other of them my net got caught and torn, while the butterfly took a few turns in the air and then re-settled. I noticed that when a cloud passed over the sun, they would fly into a high tree near, and close their wings till the cloud had passed. Another flower these butterflies seem attached to is *Scabiosa succisa;* indeed these two were the only flowers I saw them on. Although usually a comparatively shy insect, I saw several flying about the high road on two warm sunshiny days, September 19th and 20th. Is it known whether the curious and beautiful variation of the underside is merely individual? I caught several specimens with the dull brown underside, and several others of the variegated, green, and different shades of brown variety. I should be very interested to get information on these points.—*A. G. T.*

YEW-TREE POISONING CATTLE.—The question of cattle being poisoned by eating the leaves, etc., of the common yew-tree (*Taxus baccata*), was discussed at some length in SCIENCE-GOSSIP for the years 1879 and 1880. Many instances were brought forward in proof of the poisonous nature of the plant. Yet at the very close of the correspondence on the subject, a writer hailing from the co. Tyrone, asserted that cattle could feed with impunity on the yew, and cited a case he had met with. Now for the satisfaction of those who consider the yew to be poisonous eating for cattle, and for the conviction of those who do not, I ask room to record a case that occurred on the 16th of November, 1887, in the demesne of the Earl of Caledon, co. Tyrone. A number of cattle were taken violently ill, and eight bullocks and one sheep died with every sign of having been poisoned.

A veterinary surgeon, Mr. Moir, of the city of Armagh, was sent for, and he made a post-mortem examination of the dead beasts, and found in all their paunches a quantity of yew-leaves, and to them and nothing else could be attributed their death. The cases have been reported at full length in the Belfast newspapers of the 17th of November, 1887. —*H. W. Lett, M.A.*

CATS AND VIOLATA.—In our garden, we had a good many roots of *Viola semperflorens* which seemed to be eaten by snails and caterpillars. But one day, to our surprise, we found a cat contentedly munching the leaves. This happpened more than once afterwards. The cat never seemed to suffer in the least from the effects of its curious meal. Can any reader account for this extraordinary feast?—*A. Verinder.*

POPULAR SCIENCE.—A SUGGESTION.—One prominent feature in SCIENCE GOSSIP, rendering it a welcome visitor to the homes of many English naturalists, doubtless is that it is constantly endeavouring to foster a love of nature in those with whom it comes in contact, and most especially in those just entering upon mature life. The facilities its pages offer for recording facts of interest; the excellent medium, it is so well recognised as being, whereby specimens may be exchanged, or mutual sympathy and help secured, each combine to render it a great promoter of those pure pleasures the observation of nature so invariably gives to those who practise it. There are many who, with sympathies keen as our own to appreciate the beautiful in things around them, yet pass through life apparently unconscious of much in their surroundings which excites the admiration of, and affords pleasure to, their fellow-men. Let us take as an instance the case of young men engaged in business in our large towns. How many of them are there who know practically nothing of the wonderful facts revealed by the microscope! A chance paper here or there, or an occasional peep through its secret-revealing tube, bounds their knowledge, and, alas! also their interest in the great world of little things. For these persons of little opportunity let me bespeak the sympathy of "our readers," and ask each one having the opportunity to seek to increase and extend the knowledge to others their training and experience has rendered so pleasurable to themselves. Particularly available is this suggestion to persons united with associations formed for the purpose of mutual culture and improvement; such as are to be met with in most of our large towns and in not a few of our villages. An experiment to this end has recently been made by the writer of this article, with most encouraging results. Our course of proceeding was simplicity itself. We first secured the aid of a few friends by asking them to place their microscopes at our disposal for an evening. We (that is my friend Mr. Wooller and myself) then gave two short addresses, announcing as a principal feature that the objects chiefly referred to in our remarks would be exhibited for inspection, and further that we were willing to give all information in our power to reasonable querists. Choosing as my subject the past influences of minute organisms, such as foraminifers, diatoms, &c., in building up the hills and rocks around us; and also referring to their unobtrusive but important functions still going forward, I emphasised my remarks by exhibiting a series of slides under the microscopes, illustrative of the subject. After a short interval for general conversation and refreshment, Mr. Wooller spoke upon the revelations of the microscope regarding our immediate surroundings, referring particularly to the light it has thrown upon the germ-origin of disease, and also upon the question of spontaneous generation. After which a number of living diatoms and other minute forms of vegetable and animal life were introduced for inspection. I have frequently given my services as an exhibitor of microscopic objects to the promoters of social evenings and similar gatherings, but nothing approaching the interest evidenced at the meeting referred to have I before witnessed. And this fact I attribute entirely to the circumstance that, by reason of our explanatory remarks, the friends present were able to understand somewhat the nature of the objects at which they were invited to gaze. Feeling there must be many readers of SCIENCE-GOSSIP acquainted with these societies and similar associations, I make bold to plead that an experiment, so satisfactory to its promoters, should be repeated by those located in other districts who possess kindred sympathies and like opportunities. The numerous queries, as to the cost and amplifying powers of the various microscopes employed, point hopefully forward to a time when some whose interest was thus cursorily aroused may adopt a more permanent pursuit after the knowledge of those beauties and marvels of nature so lavishly distributed around them.—*T. Corlidge.*

POND DREDGING AND COLLECTING.—Will some reader be good enough to give a few hints on collecting Infusoria, Rotifera, Polyzoa, &c., stating best description of net to use and how to use it? The information would, no doubt, be interesting to others besides myself.—*L.*

YEW-TREES, THEIR SIZE AND AGE.—With reference to your correspondent P. J.'s query, the late Mr. Edwin Lees, in his "Botany of Malvern" (p. 100), says: "The two finest yews in the Malvern country are in Cradley churchyard—the largest is 26 feet in circumference at a yard from the ground. These may be calculated at about 800 years old." Now taking π as $3\frac{1}{7}$, 26 feet circumference gives $8\frac{3}{11}$ feet diameter, and about 50 inches radius. And if the tree is 800 years old, it has added a ring of the breadth of $\frac{1}{16}$ of an inch each year. Surely P. J. is wrong in calculating the age of the tree by the length of the diameter.—*A. G. Tansley.*

YEW-TREES, THEIR SIZE AND AGE.—In the interesting note by P. J., p. 21 of the current number of SCIENCE-GOSSIP, there appears to be an omission of one item in making the calculation. Instead of the whole diameter, should it not be the half of it, and hence the age reduced in the same proportion? By the method adopted each annual ring is reckoned twice over, that is, on the opposite sides of the centre. In the case quoted, the circumference of 33 feet would give a diameter of about 11 feet, and a radius of $5\frac{1}{2}$ feet. Then, taking a line as the average thickness of a year's growth, we have $5\frac{1}{2} \times 12 \times 12 = 792$ years, which is probably nearer the truth. We have a few yew-trees in churchyards in South Beds, and hope to have opportunities to measure them, when the results will be forwarded.—*J. Saunders, Luton.*

YELLOW (OR RAY'S) WAGTAIL.—The note under this heading, page 22, is rather vague. S. M. C. does not give the date when the wagtails were seen, nor does he say how near his garden is to the town of Weymouth. If they were observed later than September, it is not likely they were Ray's wagtail

but more probably the Gray Wagtail (*M. boarula*), which has some bright yellow about it, though it is unusual to see so many as ten together. There is nothing improbable in Ray's wagtail dropping into a garden near a town when on passage. In Sussex Ray's wagtail is seldom seen after the middle of September.—*William Jeffery.*

V. Atalanta in Dundee.—During the past season, insects have been in abundance in this district; it has been one of the best, during the last four years to my knowledge. As regards *V. atalanta*, I may say it has been scarce. I spent a good deal of time searching for the larvæ, and got about two dozen; three of them as late as the end of October, when the last of them emerged from pupæ as late as December 8th. They have been very scarce here the last three years. During the autumn of 1884 they were in hundreds, scarcely a plot of nettles escaped them.—*Peter Kirk.*

Ancient Yews.—Through the courtesy of the Rector, the Rev. H. Hawkins, I am enabled to give P. J., Emsworth, particulars of a yew-tree, growing in Crowhurst Churchyard, Battle, Sussex. It measures thirty-three feet in circumference, and is supposed to be about 800 years old. A seedling yew has rooted itself in a crevice of the church tower. It is now a small bush about 70 years old, and, apparently, neither increases nor diminishes in size. If P. J., Emsworth, will send me address, I shall be pleased to forward for his acceptance a photo of the tree.—*W. E. Windus.*

A Note on Philodina citrina.—In Science-Gossip for March, 1887, appeared a short note of mine on a variety of this species, which I found in the summer of 1886, in a stream near Cheadle, Staffordshire. This variety is very abundant on the moss covering some stones over which the water falls. More recently—namely in the summer, autumn, and winter of 1887—I have found a few other races which certainly approach the variety very closely, though, perhaps, none of them differs quite so remarkably from the recognised form of the species. The most numerous of these lately found colonies is in a very similar situation to that in which the variety flourishes, the main difference being that the waterfall in this case is at the foot of a large pond. There is a more luxuriant growth of moss here than in the stream. The particular form of the species which I found here differs from the variety described last year in its smaller size and in the greater conspicuousness of the eyes, which, however, are still very small. The brown colour also is less marked, though it seems almost constant in the larger specimens. This race, however, has that uniform slenderness which Mr. Gosse found to be characteristic of the variety. On the whole, it may be said to be considerably less abnormal than the latter, but at the same time to differ markedly from the type of the species which must be familiar to students of the class from Mr. Gosse's figure in Hudson and Gosse's "Rotifera" (plate ix. fig. 6). The "strongly social manners" which Mr. Gosse, in a letter to me, ascribed to my variety seem equally characteristic of this race. I have seen a piece of moss in the live-box completely fringed with the protruded heads and necks of these Philodinæ. Up to the present time, unfortunately, I have not been able to keep many specimens from this locality alive for more than a day or two. A few specimens generally maintained a lethargic existence amid the corpses of their fellows. The race which I propose to mention next, lives in close proximity to what I call the variety; that is, the form briefly described in Science-Gossip for March last year. The variety itself flourishes in a small waterfall; this other race I have found in water dipped from immediately above the fall. It departs less widely than the form last described from the ordinary type of the species, for it has not the brown colour, and the colour is in this form, as in the ordinary type, confined to the central parts of the animal. But this also has the slenderness of the variety, and there is no abrupt transition from the body to the foot. There is here a tinge of green in the yellow colouring of the trunk. All the specimens of this race that I have seen are very much smaller than the variety, which indeed is one of the largest of the Rotifera with which I am acquainted. I have found quite recently in a small spring, the sides of which are covered with moss, a number of examples of *P. citrina* scarcely distinguishable from the variety, except by the fact that the eyes are less inconspicuous. These organs have here the oblong shape characteristic of the species; but they are placed very far back, almost behind the mastax, even when the animal is fully extended. They are exceedingly small. I have also met with a race, on moss growing near the outlet of a large pond, which is not easily distinguished from the variety, though the brown hue seems less decided; but I have hardly seen this often enough to be able to say much about it. The foregoing remarks seem to show that this pretty and interesting species is very variable. Mr. Gosse has stated, in Hudson and Gosse's "Rotifera," that the colour varies; but it will be seen that the form of the animal and the distribution of the colour also vary considerably. My experience also goes to show that the species is much commoner than has been supposed; but it may be that it is common only in certain districts. It would be interesting to know whether other observers have found *P. citrina* in abundance on moss, especially in waterfalls; and, if so, whether they have found the species to depart in any marked degree under such circumstances from the normal type. I have found examples agreeing well with Mr. Gosse's descriptions and figures (in "Rotifera" and in "Tenby") in several places near Cheadle, but never in any great abundance. In conclusion, I should like to express my great obligations to Mr. Gosse, who has most kindly answered letters of mine from time to time, and identified several species for me.—*J. W. Blagg, F.R.M.S.*

Rudiments and Vestiges.—I fear the authority quoted a little depreciates Doctor Darwin as an expounder of Divine Providence, and considers the *phusis kerata taurois* somewhat unsound. It will, however, be palpable that the reasoning requires the "image of God" in man should be mental, neither can the distinct theological proposition of a physical "ideal form" be established in regard to the most helpless of animals, without a consideration of his surroundings, where we see adaptation as a portion of the operation. The difficulty as regards the theistical aspect of this question is the danger of making over to society perhaps, what was intended for philosophy. Preoccupied with such ideas, I put my elbow through a well-ordered case of beetles in a continental museum. Madame hastened to the scene in consternation. I offered to pay the damage. Madame must ask Monsieur. Madame suggested a franc, the sworded *concierge* demanded three—three were paid. A little after, Madame and a friend were observed to issue from a crockeryware shop, each with a basket in hand containing about a franc's worth of household requisites.—*A. H. Swinton.*

THE FLORA OF NEWFOUNDLAND AND LABRADOR.—I am engaged in investigating the subject of the flora of Newfoundland and Labrador, of which very little is known, especially here in the country itself. For our knowledge we are mainly indebted to those few naturalists who from time to time have visited Newfoundland. I am now compiling a complete list of our flora, as far as it is known, and this appears at intervals in our St. John's "Colonist." I am also preparing for that paper, and ultimately for separate publication, articles on our "Wild Fruits and Berries." I should feel much obliged for help in the matter, especially in following heads:—

1. In what books or magazines (English or American) can I find information as to our flora?

2. To what societies or institutions (Linnæan), and to what papers could I apply for help, and which will feel an interest in my work?

3. What magazines and papers would afford me most help as to botanical matters?

4. Where could I obtain good coloured engravings of wild flowers and fruits?

5. What books are available on the subjects of wild fruits, especially of England and North America?

6. What are the cheapest and best books (with coloured plates) on North American and British ferns, mosses, lichens and seaweeds?

I send you some local papers containing some of my articles, and, if you care for a complete set, will gladly send them; they may be worth a notice in your magazine. I shall be glad to send, by parcel post, roots of some of our Newfoundland ferns and flowers, which are unknown or rare in England, in return for useful books and articles on botany.—*Arthur C. Waghorne.*

PROLIFIC POND.—Since the foregoing (SCIENCE-GOSSIP, No. 272, Aug. 1887, page 185) was written, I have been fortunate in finding the following, which being added to the previous list brings up the number of species to forty-four, and so making my pond equal to the best recorded instance—1. *Dinocharis tetractis*; 2. *Notommata aurita*; 3. *Furcularia ensifera*; 4. *F. melandricus*; 5. *Monostyla bulla*; 6. *Diglena grandis.* Nos. 4 and 6 are Mr. Gosse's identification, from a tube I sent him. No. 4 I do not know, but presume it is one of the new species which has to appear in the "Journal of the Royal Microscopical Society."—*J. E. L.*

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.

C. T. H.—One good method of mounting the smaller fossils of the Bartar clay is on black paper within glass-topped boxes.

R. P., jun. (Airdrie).—The flat zoophyte is *Membranipora membranacea*, the other *Sertularia falcuta.* The little round objects are the cases of a marine worm (Spirorbis). The objects from Macassar Straits are a species of the larger tropical foraminifera.

C. C. DALLAS.—Judging from your rough sketch and description, we believe cup-shaped object attached to a twig is the empty pupa case of one of the saw-flies.

J. H.—See Maund's "Botanic Garden." Capital illustrations of the tea-plant may be seen and studied at Kew, where all information might be obtained.

MISS W.—There is no doubt your shell is a cowrie (*Cyprea caurica* or *C. lynx*, but it is impossible to be certain from a verbal description only.

A. R. T. WINCHLEY.—"Up the River from Westminster to Windsor" was published by Hardwicke and Bogue in 1876. Apply for information concerning it to Messrs. W. H. Allen and Co., Waterloo Place, London.

C. D.—Your lichen is *Cladonia cornucopioides.* Get the "Young Collector" series on "Lichens and Mosses," price 1*s.* (Swan Sonnenschein and Co.); afterwards Lindsay's "British Lichens," price 10*s.* 6*d.*, coloured plates.

F. LANNON.—Get Coleman's "Our Woodlands, Heaths and Hedges," illustrated, price 3*s.* 6*d.* Mount your sections of woods in Canada balsam.

I. BOWMAN.—We shall be very pleased to receive your ornithological papers.

T. B. G.—Your mineral is a crystal of selenite from the London clay.

X. R.—You will find a full description of fossil encrinites (with illustrations) in Taylor's "Common British Fossils, and where to find them," price 7*s.* 6*d.* (Chatto and Windus).

EXCHANGES.

WANTED, skins of British mammals, particularly pole-cat, water-shrew, badger, otter, martins and chiroptera. Many valuable works on natural history offered in exchange. List on application.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, Star-fishes and sea-urchins; must be in good condition. Books and specimens of natural history offered in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, stalk-eyed crustacea (British). Good return made.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, small serviceable microscope; will give in exchange a solid silver verge hunter.—A. G. H., 10 St. John's Hill, New Wandsworth, S.W.

WILL give a small collection of mounted seaweeds, 2 vols. "Family Friend," several numbers of "Cassell's Popular Recreator," in cover with leather backs, few fossils, &c., for "Dana's Mineralogy," or Lyell's "Geology."—A. G. H., 10 St. John's Hill, S.W.

OFFERED, British coleoptera, for insects of other orders to illustrate mimicry, or pairs in which the sexes show great difference of form or colour.—C. H. Goodman, 9 Dorlcote Road, Wandsworth Common.

WANTED, copies of Schuckard's "British Bees," and of Newman's "Butterflies and Moths."—R. B. Postans, 14 Enys Road, Eastbourne.

SHOULD be obliged if conchologists would send *L. peregra* and vars. from any localities. Good exchange.—F. R. Fitzgerald, Harrogate.

WANTED, British and foreign clausilia. Good exchange.—Fitzgerald, Harrogate.

LYELL'S "Travels in North America," 2 vols., and "Second Visit to the States," 2 vols. What offers?—C. L. Lord, 34 Burlington Crescent, Goole.

WANTED, some common frogs (preferably in their winter torpor). Good exchange in books, etc.—J. Eyre, 4 Kender Street, New Cross Road, London, S.E.

WANTED, in exchange for fossils, flint or bone implements, from any locality.—A. T. Tichborne, Lodge, Oakfield Park, Croydon.

WANTED, Annals and Magazine of Natural History; books on spiders, sponges, gorgonias, etc., or material. In exchange I will give other books, very superior microscopical slides, etc.—Rev. J. E. Vize, Forden Vicarage, Welshpool.

FULL-GROWN frog wanted. Will give micro-slide in exchange or pay postage.—J. M. Bain, 11 Bothwell Street, Glasgow.

LANTERN views only once used; about 2 dozen fine Scotch views in exchange for apparatus or books.—J. M. Bain, 11 Bothwell Street, Glasgow.

WANTED, specimens of British bees; will give in exchange Lepidoptera, Coleoptera or Diptera (the latter well set on cards, but unnamed).—A. E. J. Carter, 9 Argyle Crescent, Portobello, N.B.

WANTED, birds' nests and eggs from all parts of the world; British specimens offered in exchange.—J. T. T. Reed, Ryhope, Sunderland.

SCIENCE-GOSSIP for Sept. 1881 to March 1882; ditto for June 1885 to Dec. 1885; "Out of Doors," by Rev. J. G. Wood; "Manual of Injurious Insects," by Miss Ormerod; and "Practical Biology," by Huxley, in exchange for Shuckard's "British Bees," Darwin's "Cross- and Self-fertilization of Plants," or specimens of Coleoptera and Hymenoptera.—A. E. J. Carter, 9 Argyle Crescent, Portobello, N.B.

WANTED, Rocking, Roy's or other good microtomes; will give large quantity of first-class slides for them.—Fred. Lee Carter, Gosforth.

WANTED, mounted or unmounted parasites; will give others in exchange—160 to select from. Send lists.—Fred. Lee Carter, 25 Lansdowne Terrace, Gosforth, Newcastle-on-Tyne.

WANTED, a good microscope and accessories, in exchange for a collection, in album, of about 1200 foreign stamps in perfect condition; catalogue value, £11.—P., 80 Leathwaite Road, Clapham Common, London, S.W.

GOOD object for the polariscope—horn, bone, whalebone, chemical crystals, &c., also micro photographs; good exchange in slides. Write first.—J. Boggush, Alton, Hants.

WANTED, good dissecting microscope; offered, well-mounted slides of rare objects, collection of echinoderms or other zoological objects.—Charlotte Sinel, Peel Villas, Jersey.

MICRO SLIDES.—A series of fern slides and others in exchange for first-class micro and magic lantern slides.—Walter Henshall, The Hollies, Bredbury, near Stockport.

FOR exchange:—SCIENCE-GOSSIP for 1884, with eleven coloured plates; what offers?—John T. Foster, Little Driffield, East Yorkshire.

WANTED, live or dead specimens of *Vitrina pellucida* and varieties; exchange given in freshwater shells.—W. E. Collinge, Springfield Place, Leeds.

IN exchange for well-mounted micro slides, bound or unbound vols. of SCIENCE-GOSSIP, a polished mahogany box to hold 104 microscopic slides.—Herbert Spencer, Masboro' House, Balham, S.W.

A QUANTITY of well-mounted and interesting slides, and land and freshwater shells, Desiderata, Newman's "British Moths and Butterflies," Cooke's "Ponds and Ditches," and books on Coleoptera, pond life and micro natural history.—James C. Blackshaw, 4 Ranelagh Road, Wolverhampton.

WANTED, foreign shells and corals, in exchange for fossils, books or cash.—J. W. E., 145 Milnrow Road, Rochdale.

BRITISH and Australian marine zoophytes wanted.—J. W. E., 145 Milnrow Road, Rochdale.

SCIENCE-GOSSIP complete for first twenty years, bound in double volumes, nearly new; also large number of good microscopical slides, animal and vegetable—what offers?—Micro, 10 Belmont, Bath.

MOUILLEFARINE, 46 rue Sainte-Annes, Paris, wishes to do extensive changes with a botanist of the New World; offers references.—Ch. Copineau, juge, Tribunal civil de Doullens (Somme).

"TOMLINSON'S Cyclopædia of useful Arts, &c." (Virtue), 9 vols., cloth, numerous fine steel plates, &c.; also "Knowledge," Nos. 1–56, in thirteen monthly parts, as published, both clean and good, exchanged; ½-plate photo lens or magic lantern preferred.—Hughes, Assistant Overseer, Bangor, N. Wales.

WANTED, named and localised English land, marine and freshwater shells, or foreign ditto; exchange fossils, coins, &c.—F. Stanley, Margate.

WANTED, named British or foreign birds' eggs, or preserved skins; exchange coins, medals, fossils or shells.—F. Stanley, Margate.

Rotifera.—Wanted, a few correspondents for occasional exchanges.—David Bryce, 37 Brooke Road, Stoke Newington Common, N.

WANTED, continental, American and foreign plants and micro-fungi, in exchange for indigenous (British) species. Correspondence with students of foreign micro-fungi invited.—Rev. Hilderic Friend, F.L.S., Carlisle.

LEPIDOPTERA.—Duplicates: Sambucata, Tiliaria, Comitata, Megacephala, Ruberata, Rhomboidaria, Phragmitidis, Iota, Umbratica, *S. Ligustri* (1). Desiderata: numerous.—George Balding, Ruby Street, Wisbech.

FOR exchange, *Planorbis glaber*, etc., for other shells.—John Clegg, 5 Derby Street, Millwood, Todmorden.

FOR exchange, *Plan. dilatatus* and *glaber* exchanged for other land and freshwater shells.—S. Clough, 20 Abingdon Street, Blackpool.

WANTED, recent editions of "Carpenter on Microscope," Beale's "How to Work with Microscope," and Lankester's "Half-hour with Microscope," will exchange numbers of SCIENCE-GOSSIP.—W. T. Porter, 19 Otley Road, Headingley, Leeds.

GOOD carboniferous fossils offered for other fossils, micro slides, or electrical apparatus.—J. A. Hargreaves, Charlestown, Shipley, Yorkshire.

Morpho cypris, *Morpho menelaus*, *Morpho æga*, the most dazzlingly beautiful of exotic lepidoptera; what offers?—Joseph Anderson, jun., Alre Villa, Chichester.

"KNOWLEDGE," in parts, 4 vols.; what offers?—Joseph Anderson, jun., Alre Villa, Chichester.

OFFERED, first-rate slides of marine algæ, illustrating structure and reproductive organs; many species. Wanted, Kützing's "Species Algarum," and other works on algæ.—T. H. Buffham, Comely Bank Road, Walthamstow.

FOR exchange, *Helix sericea*, *Helix hortensis*, var. *olivacea*. Wanted, *Limnea glutinosa*, *Limnea involuta*, *Helix lamellata*, *Helix pomatia*, all vars. of *Helix aspersa*, except *minor*; all vars. of *Helix caperata*, *Bulimus acutus* and its vars., and vars. *albina* of *Pupa umbilicata* and *Pupa marginata*, and many others.—A. Hartley, 15 Croft Street, Idle, near Bradford.

WHAT offers for the following?—6 vols. of Lardner's "Science and Art;" 2 vols. "Handbook of British Fungi," by M. C. Cooke, M.A.; 2 vols. "Food and its Adulteration," by Hassall; 1 vol. "Materia Medica;" "How to Work with the Microscope," by Beale; "Mounting Microscopic Objects," by Davis; a microscope preferred.—J. H. Morgan, St. Arvans, Chepstow, Mon.

FOSSILS from all formations desired in exchange for other fossils from lias, magnesian limestone, &c.—John Hawell, M.A., Ingleby-Greenhow Vicarage, Northallerton.

AMMONITES and belemnites desired in exchange for fossils, minerals, shells, &c.—John Hawell, M.A., Ingleby-Greenhow Vicarage, Northallerton.

BERG-MEAL, or mountain-meal, from Norway, slides, and a small quantity of material, both prepared and unprepared, in exchange; good diatoms preferred. Send lists.—Rev. A. C. Smith, 3 Park Crescent, Brighton.

OFFERED, complete clutches, with full data, of dipper, magpie, long-eared owl, tawny owl, black grouse, red grouse, snipe, curlew, kittiwake and others. Wanted, over a hundred species of British eggs, in clutches, many of them not uncommon.—B. A., Clifton House, Uxbridge.

A LOT of land, freshwater, and marine shells to name; would any of your readers name these for me (true name required), and in return would send two of each species, if possible, for their trouble?—John Jos. Holstead, 19 Millholme Terrace, Upperby Road, Carlisle.

WANTED, *Isocardia cor* and other British shells; exchange *Cardium aculeatum* and a variety of other kinds of marine and freshwater shells.—Mrs. Heitland, The Priory, Shrewsbury.

BOOKS, ETC., RECEIVED.

"A Flora of Hertfordshire," by the late A. R. Pryor (London: Gurney & Jackson). "Mineralogy," by Frank Rutley, third ed. (London: Thos. Murby).—"Elementary Text-book of Physiography," by W. Mawer (London: J. Marshall & Co.). "Report of the U. S. Commission of Fish and Fisheries for 1885" (Washington: Government Printing Offices).—"British Frogs and Toads," by Linnæus Greening.—"Botanical Record Club, Rept. for 1884, 1885, 1886."—"Trans. Royal Soc. U. S. Wales."—"Journal of Conchology."—"Book Chat."—"Scribner's Monthly."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Sci"—"Scientific News."—"Wesley Naturalist."—"Naturalists' Monthly."—"La Science Illustrée."—"Junior Review, Science, Lit. & Art."

COMMUNICATIONS RECEIVED UP TO THE 13TH ULT. FROM: A. G. T.—W. B. G.—W. R. W.—P. B.—C. R.—I. S.—J. T. T. R.—T. H.—J. G.—G. K. G.—F. H. A.—A. H.—T. H. B.—J. A., jun.—J. A. H.—W. T. P.—J. C.—G. B.—J. H.—J. H.—A. C. S.—Rev. H. F.—B. A. C.—J. J. H.—H.—S. C.—H. B.—F. S.—D. B.—H. O. H.—W. W.—J. H. G. J. W. E.—G. E. E., jun.—J. E. B.—J. W.—B.—F. L. C.—W. H.—W. E. C.—R. T.—C. R.—W. J.—J. T. F.—P. K.—C. D.—F. L.—W. E. W.—C. L.—I. B.—R. F. G.—W. E. W.—C. J. W.—M. A. B.—F. R. F.—Z. W.—A. G. H.—G. E. E., jun.—E. W.—N. L.—&c.

NOTES ON GEOGRAPHICAL DISTRIBUTION.

By T. D. A. COCKERELL.

[*Continued from page* 26.]

AS regards the avi-fauna of the Colorado region, the Mexican and American element is much more in the ascendant, and up to the present I have only observed four which are specifically identical with those in the British list, and of these *Agelæus phœniceus* and *Ceryle alcyon*, are only occasional and certainly not native in Britain, while *Pica rustica* is represented by the variety *Hudsonica* only, and *Anas boscas* alone is quite identical with a native British bird.

At present I have only two Colorado crustacea on record, and of these *Gammarus robustus* is allied to our English *G. pulex*.

The Arachnida have not yet been worked out, but they have a decidedly European stamp, and most belong to English genera ; the same may be said of the Myriapoda, the genera Julus, Lithobius and Geophilus having abundant species closely allied to their British representatives.

The Coleoptera, with certain conspicuous exceptions, are very like the British species, such genera as Amara, Bembidium, Cicindela, Pterostichus, Coccinella, Aphodius, &c., being well represented, while a Pœderus, very like littoralis, is common in certain districts, and I have found European-looking species of Meloë and Quedius.

Many of the Hymenoptera are peculiar, yet there are species of Bombus, Vespa, Odynerus, Chrysis, &c., resembling British forms.

The Neuroptera are to a great extent European in general character.

The Lepidoptera are also many of them of European type, an Alucita resembling polydactyla (hexadactyla) is frequent on windows, and many other European genera abound. Of the sixty Rhopalocera I have on record, as inhabiting Colorado, only two, *Vanessa antiopa* and *Danaïs plexippus*, have been taken in England, and we know the last to be a recent introduction, but forty-nine belong to British genera, and *Pieris oleracea* represents *P. napi*, modified by changed conditions, as does *Vanessa milbertii*, *V. urticæ*, and several others are closely allied to European species.

The Diptera are similarly for the most part of British genera, Tabanus, Tipula, Lucilia, and Muxa being abundant, and among the Hemiptera we find representatives of such genera as Leptocoris, Lygœus, Miris, Calocoris, Notonecta, Corixa, Cimex, Cicada (5 species) and Jassus.

The only two leeches I have note of belong to the genera Aulostomum and Clepsine ; earthworms (Lumbricus) are rare, I am told that a few exist in Wet Mountain Valley, but I have not been able to secure an example.

The flowering plants of Colorado have been ably described by Dr. J. M. Coulter, and present many features of interest.

In the Ranunculaceæ all the genera are British, as well as the following species :—*Myosurus minimus*, *Ranunculus flammula* (represented by var. *reptans*), *R. sceleratus*, and *R. trichophyllus*. The only species of Papaver is *P. nudicaule*. Among the Cruciferæ are *Draba incana*, var. *confusa*, *Cardamine hirsuta*, *Erysimum cheiranthoïdes*, *Nasturtium palustre*, *N. officinale* (but this is an introduction, it has been found near Denver, and I found it on Saguache Creek, above Rock Cliff), *Camelina sativa*, and *Lepidium*

sativum. The seven species of Viola include *V. palustris* and *V. canina*, var. *sylvestris*. *Cerastium alpinum* (var. *behringianum*) and *C. arvense* occur, as well as *Arenaria verna*. Hypericum, so prominent in England, is represented by only a single species, *H. scouleri*. Astragalus is a huge genus, with forty-six species, including alpinus and hypoglottis. *Fragaria vesca* is abundant. Six species of Saxifraga, hirculus, cæspitosa, cernua, rivularis, stellaris (var. comosa), and nivalis are also British (Saxifraga is an essentially boreal genus. Lieut. Greely found *S. rivularis* (var. *hyperborea*), *S. cernua*, *S. oppositifolia*, *S. nivalis*, and *S. cæspitosa* in the Arctic region of Grinnel Land). The six species of Epilobium include angustifolium, alpinum, and palustre (var. lineare). *E. angustifolium* is excessively abundant; on Sept. 5th, I passed through a burnt-up spruce-forest on Pottery Pass,* between Wheeler and Red Cliff, and the charred trunks no longer shading the ground, a dense growth of this species had sprung up, together with species of Aster, &c., completely covering the soil. *Adoxa moschatellina* is found, and *Linnæa borealis* and *Galium boreale* (this last I found on the Grand Mesa, at an elevation of about 8900 feet). Erigeron is a large genus, and includes *E. acris*.

Senecio has 16 species, but none are British; the genus is probably boreal, but the species are unstable, and soon vary under new conditions. Hieracium, a large English genus, has only three species and a variety in Colorado; but *H. umbellatum* is given as "from Lake Superior to the Rocky Mountains." *Taraxacum officinale* has the varieties *alpinum* and *scopulorum*, and I found an ordinary-looking dandelion by Swift Creek, Custer Co. The three species of Primula are farinosa, parryi, and angustifolia. Parryi I found abundant on the Sangre de Cristo Range. Gentiana is represented by ten species—as might be expected of such a typically Alpine genus. Polemonium has four species, including cæruleum. *Myosotis sylvatica* appears as the var. *alpestris*, a forget-me-not of the most vivid blue, which I found growing in little compact bunches on the top of the Sangre de Cristo Range on August 4th, right above timber line, with Parnassius (near to Apollo) and an Alpine Colias to keep it company. *Chenopodium hybridum*, *glaucum* and *rubrum* are found—I picked the last near Surface Creek, Delta Co. Polygonum has several species, but the only two British ones, *P. aviculare* (Pikeview, El Paso Co., July 13th) and *P. convolvulus* (Salida, Chaffee Co., Oct. 19th), are probably not indigenous. *Humulus lupulus* is common. The only species of Orchid common to Britain are *Corallorhiza innata* and *Spiranthes romanzoviana* (this last an example of the migration of boreal species into Ireland). The Juncaceæ include *Luzula campestris* and *spicata*, and *Juncus filiformis*, *triglumis*, *castaneus*, and *tenuis* var. *congestus*. The three Naiadaceæ are *Zannichellia palustris*, *Potamogeton rufescens* (a Middlesex and Surrey plant) and *P. marinus* var. *occidentalis*. The representatives of Scirpus are *cæspitosus*, *lacustris* var. *occidentalis*, and *sylvaticus* var. *digynus*. Carex has forty-nine species, mostly European, or allied thereto, and includes *C. pyrenaïca*, *rupestris*, *capillaris*, *ampullacea*, *vulgaris*, *atrata*, *alpina*, *muricata*, *fœtida*, *vulpinoïdea*, *disticha*, *echinata*, &c. The Gramineæ are to some extent peculiar, but the list includes *Alopecurus alpinus*, *Calamagrostis stricta*, *Festuca ovina*, &c. The twenty-two Pteridophyta have the following common to Britain:—*Isoëtes lacustris* (var. *paupercula*), *Lycopodium annotinum*, *Botrychium lunaria* (and also the doubtfully British *B. lanceolatum*), *Asplenium septentrionale*, *Phegopteris dryopteris*, *Lastræa filix-mas* (var. *incisa*, Mett.) *Equisetum pratense* and *E. variegatum*. The fungi have not yet been worked out, but there is no doubt that most of the species are also European. I have myself found *Agaricus* (*Psaliota*) *campestris* in more than one locality. Cases of poisoning, supposed to be due to Ergot (*Claviceps purpurea*) are reported by Professor Wm. Trelease.

Farther north, the evidences of the boreal fauna and flora become even more apparent. I was much interested in examining the collection of the Entomological Society of Ontario, Canada,* and noticed therein specimens of the following British species from the immediate neighbourhood of London, Ontario:—*Syritta pipiens*, *Apis mellifica*, *Metrocampa margaritata*, *Ennomos alniaria*, *Euplexia lucipara*, *Noctua plecta*, *N. c-nigrum*, *Agrotis saucia*, *Chelonia caia* (var.), *Nomophila noctuella* (this a migratory species), *Galleria cereana*, *Eupithecia absynthiata*, *Vanessa antiopa*, *V. cardui* (this species is said to have occurred in millions in some parts of Canada in 1885), *Danaïs plexippus*, *Ptinus fur*, and *Chrysomela* (*Gastrophysa*) *polygoni*. It is very probable that some of these species were introduced by human agency, but some are doubtless boreal. One feature in the collection was the presence of no less than twelve species of Plusia, none of them British. In the extreme north, where all the species are boreal, the proportion of species common to Europe becomes overwhelming. Greely gives a list of species found on the expedition to Grinnel Land; of the nine birds eight are British, and of the twenty-five flowering-plants, sixteen belong to British species. His list of Cryptogamia also includes *Equisetum variegatum*, *E. arvense*, *Barbula alpina* and *Cladonia rangiferina*.

So much for the boreal fauna and flora of Britain. I will not now deal with the Eastern and Western groups, nor the Asiatic distribution of certain species. As regards Africa, it may be said that the portion south of the Sahara has no relation to the British fauna, and, perhaps with a few exceptions, *all the*

* This pass has no name on the map; we named it so, because we found some fragments of ancient pottery and a stone arrow-head there.

* Exhibited at the Colonial Exhibition, South Kensington.

British species found in Africa, south of the Sahara, are either migratory or were imported by human agency.

Certain European Lepidoptera are conspicuous in all African collections, and these I regard as belonging to the migratory group *—such are *Acherontia atropos* (from Natal to Gambia and Kilimanjaro), *Sterrha sacraria* (Kilimanjaro), *Chœrocampa nerii* (Natal and Gambia), and the following species in a collection from Gambia—*Deiopeia pulchella*, *Heliothis peltigera*, *Plusia ni*, *Chœrocampa celerio* (a species wandering even to New Caledonia), *Sphinx convolvuli*, and *Lycæna Bætica*.

T. D. A. COCKERELL.

West Cliff, Custer Co., Colorado.

A CHAPTER ON BENZOYLSULPHONICIONIDE, OR SACCHARINE.

By DR. ALFRED CRESPI.

SUCH is the somewhat uncouth and unfamiliar name that will soon be known to every one. It is the scientific designation of that singular sweetening agent which, though known to scientific men for some little time, came prominently before the public in the presidential address of Sir Henry Roscoe, at Manchester, six months ago. Such a name ought to cover properties quite out of the common run, and when we inform the reader that saccharine—the name it will popularly be known by—is 250, or, it may be, 300 times as sweetening as cane sugar, his curiosity will be aroused.

Unfortunately, the medical and scientific papers often contain reports, framed in all fairness and goodwill, of marvellous discoveries in electricity, chemistry, agriculture, and medicine, that it is confidently promised will revolutionise modern life; and while we remain on the *qui vive*, looking out for more information, and hoping soon to profit by the discovery proclaimed in such warm terms, we wait in vain, and the world goes on in its humdrum way much as usual, neither the better nor the worse for the march of scientific discovery.

It is reassuring to be told that saccharine will not drive cane and beetroot sugar from the field, for those familiar objects of daily use there will still continue some demand; but it will be useful in culinary operations, and as medicine, and as a flavouring agent, and perhaps in other ways.

Its sweetening properties are remarkable. One grain of the ammoniacal hypo-sulphite of silver will render 32,000 grains of water distinctly sweet; but one grain of saccharine, according to Professor Stutzer, of Bonn, will sweeten 70,000 grains of water.

* Vide "Entomologist's Monthly Magazine," March, 1885, p. 233.

Saccharine is one of the many derivatives of coal-tar, and was very fairly described by Sir Henry Roscoe, in a lecture at the Royal Institution, as "the most remarkable of all the marvellous products of the coal-tar industry." Now when all is remembered that coal-tar has done for mankind in the shape of providing colours, essences, and flavours, in the past thirty years, this is strong praise.

Saccharine is a white amorphous powder, and when examined under the microscope, is found to have a crystalline appearance. It melts, or fuses, rather, at a temperature of 424° Fahr., and then undergoes partial decomposition, while it gives off a powerful and easily recognisable odour. Placed upon the tongue, in its pure state, it is rather disappointing, as its sweetness is less marked than one would expect. Two explanations offer themselves: in the first place, it is not, in its pure state (nor will even the saliva thoroughly dissolve it) highly soluble in water; and in the second, its strength is so great that it deadens, by its very intensity, the nerves of taste, much in the same way as when we enter a brilliantly-lighted room, on a dark night, we are dazzled from the pupil being widely dilated, or, better still, much as a beam of electric light falling from a short distance upon the retina causes confusion of vision and dizziness.

Saccharine must, therefore, be regarded as an essence, as *par excellence* the concentration of sweetness, and to get its full power needs free and intelligent dilution. Vanellin, another of the many wonderful products of coal-tar, which is rapidly displacing the older and better-known vegetable flavour vanilla, is also overpoweringly pungent, and far pleasanter in a less concentrated form. In cold water saccharine is hardly at all soluble, and although it is more soluble in warm water, it is not till it is mixed with boiling water that it becomes very soluble. The completeness of the solubility is greatly increased by neutralising the fluid in which it is placed, and this can be done most readily by adding carbonate of soda or carbonate of potash, two sufficiently familiar articles in most well-to-do households. Saccharine expels the carbonic acid present in the solution, and soda or potash salts of saccharine are formed that taste almost as sweet as pure saccharine itself. Probably for commercial and domestic purposes saccharine will soon come into common use in the form of an alkaline powder. Messrs. Burroughs, Wellcome & Co. sent us some tabloids containing half a grain of saccharine, and equivalent roughly to a large lump of loaf sugar. We find that it is better to put the tabloid in the cup, and then pour in hot tea, coffee, or cocoa, and after stirring a few times, adding the milk or cream. The flavour is in no way peculiar, but scarcely as agreeable as cane sugar, though use would soon remove that little objection.

Alcohol, that powerful solvent of many alkaloids

and strong chemical agents, takes up saccharine freely. One gallon of a 40 per cent. mixture of alcohol and water will hold 1391·6 grains; a gallon of 80 per cent. alcohol takes up 2250·5, while absolute alcohol—that is to say, alcohol perfectly free of any admixture of water—only takes up 2118·9 grains. This great solubility of saccharine in alcohol will be of much service to manufacturers of pure British wines, liqueurs, cordials, and essences. In practice, it is found more convenient to dissolve the sweetening agent in warm solutions of alcohol and water. Warm glycerine also dissolves it well, but the presence of glycerine would unfit the solution for domestic purposes.

Saccharine promises to have three great fields before it, if not more. Its culinary uses may not be very great—though opinions are divided on that point—except for the preparation of sweetmeats and confectionery; and as it has already been found possible to manufacture pure and wholesome sweets flavoured with it, and not containing cane sugar, it can hardly fail to give a decided impetus to the sweetmeat trade. Unfortunately it must not be forgotten that sugar is a valuable and cheap food, agreeing well enough with most people, and the substitution of minute quantities of saccharine for common sugar will diminish the nutritive properties of the foods to which it is added. Again, it can be used to cover the sickening taste of many strong drugs, at any rate, the medical papers promise, in their usual hopeful spirit, great things in that direction. Every practical physician soon learns, however, that tasteless and so-called palatable preparations of strong modern medicines are often, after two or three doses, most repulsive to the patient, and it may be found that after the first wonder is over, people will prefer the drug in its ordinary form to taking it mixed with saccharine. Time will show; and we cordially wish the enterprising chemists who have taken up this part of the work all the success their good intentions merit.

Lastly, saccharine is not changed in its passage through the body, and does not ferment like cane-sugar. It is also said to have powerful antiseptic properties; in many cases, therefore, in which the aged sufferer craves for sweets, but cannot, without pain indulge in that, to him, dangerous luxury—cane-sugar—he will now, we must hope, be able to fall back upon saccharine, which, again, in many familiar, but not the less loathsome and destructive diseases, is found to be an invaluable help to the skilful physician.

We have, we think, said enough to show that, much though the world owes to chemistry and to coal-tar, it is not often that a discovery like that of saccharine gives promise of greater things to come in the days, not perhaps far distant, when the chemist will, in his laboratory, manufacture many of the commoner and more useful foods.

Wimborne.

THE VINEGAR EEL (*ANGUILLULA ACETI*).

OWING to the fact, that vinegar is now usually freed from its mucilaginous impurities (on which this creature feeds), the vinegar eel is not such a common object for the microscope as it used to be.

The mature female anguillula (Fig. 21) is about

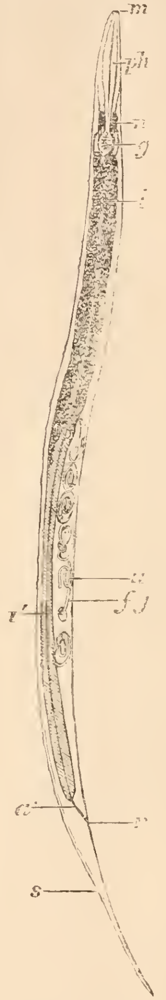

Fig. 21.—Mature female. (*m*) mouth; (*ph*) pharynx; (*n*) position of nervous ganglion; (*g*) gizzard; (*i*) intestine; (*i'*) lower portion of intestine; (*a*) rectum; (*r*) anus; (*s*) style.

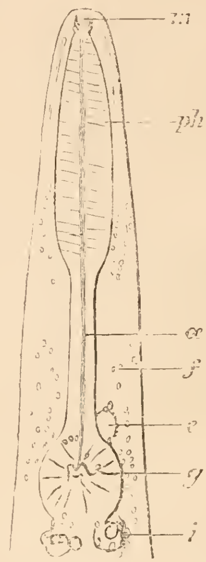

Fig. 22.—Head of vinegar eel, female. (*m*) mouth; (*ph*) pharynx; (*æ*) œsophagus; (*g*) gizzard; (*i*) intestine. × 250.

one-tenth of an inch in length, the mature male, one-fifteenth. Both sexes seem to vary in size.

The body is long and filiform, of nearly uniform thickness, but tapering gently towards the head and less gradually towards the tail, which ends in a long, fine spine. The transparent body permits a close examination of the internal structure.

The females are viviparous, and the young may be seen in a mature female inside the body. In outward form the sexes are very similar, the only difference being that the tail of the male bears three small processes (Fig. 23, *pr*).

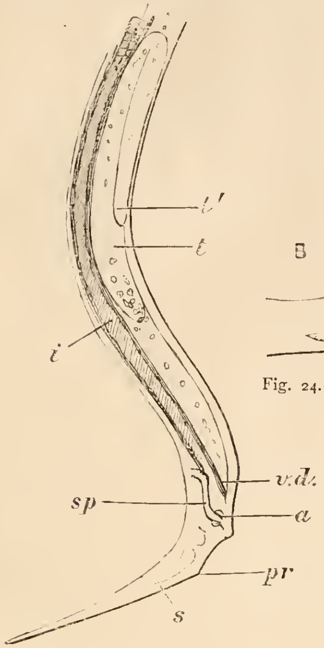

Fig. 23.

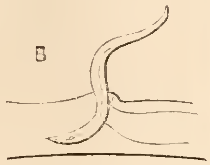

Fig. 24.—Young anguillula escaping.

The reproductive organ of the male is a long, broad testis, bent upon itself at its upper portion; it opens by a very short vas deferens by the anus (Fig. 23). Two conspicuous spicula, shaped like the letter S and contained in sacs, are situated at each side of the vas deferens and open into it; they act as claspers during the sexual process.

In the female the generative opening is situated a little behind the middle of the body. This opening leads into an oval chamber and into the broad pouch. The large uterus, or broad pouch, seems more a cavity hollowed out in the body than a chamber with definite walls; it passes forwards and ends in a long protoplasmic cord or ovary (?) which bends and passes over the intestine. The uterus is perhaps continued posteriorly, for I have found young sometimes in that region of the body, when the female contained many embryos. Young vinegar eels may be observed in the broad pouch in various stages of development. The youngest embryos are situated at the extreme end of the uterus; the older ones nearer the generative opening. Some of the youngest may be seen, invested in a delicate shell, undergoing segmentation. The older ones exhibit a slow rotatory movement, which I believe is due to their rapid growth in length. The oldest of all have evidently escaped from the shell and move about uneasily. When the vinegar eel has finished its early stages of development inside the mother it escapes by the generative opening, wriggling its way through the somewhat narrow passage (Fig. 24, B). Soon after its escape it becomes very lively.

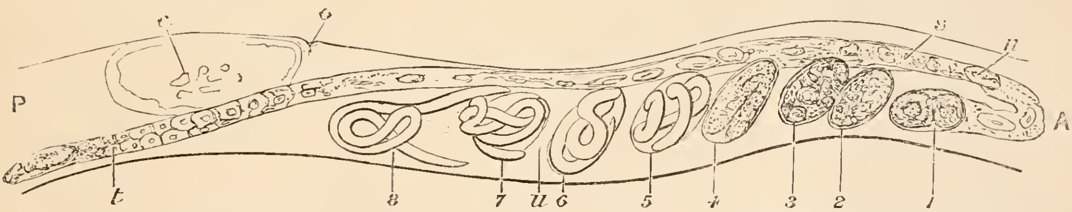

Fig. 25.—Reproductive organs of female. (*o*) generative organ; (*c*) chamber; (*s*) portion of ovary containing large nuclei; (*t*) portion containing small nuclei; (1–8) young eels in various stages of development; (A) interior end; (P) posterior end. The intestine is not represented.

The alimentary canal is a straight tube, traversing the whole length of the body cavity. The small mouth which opens anteriorly is surrounded by a horny capsule (Fig. 21, *m*). The pharynx (*ph*) has muscular walls with transverse striæ, it leads into a narrow œsophagus (*œ*). The gizzard is round and very thick walled; the muscular striæ radiate from the small central cavity. The rest of the digestive tube consists of a long hind-gut or intestine (*i*) occupying the greater portion of the body. The anterior portion of this organ is broad and much serrulated; near the reproductive system it becomes narrower and passes to one side. A short rectum (if it can be so called) leads to the anus, which opens near the root of the tail.

The long ovary contains numerous nuclei imbedded in a protoplasmic matrix. These nuclei are more crowded within a short distance of its extremity, where they disappear.

I was not able to observe the excretary system. I believe it consists of long unbranched canals parallel to the long axis of the body, and opening near the middle. I do not know whether it is possible to see the nervous system without previous preparation.

I have drawn (Fig. 22) a small round body (not easily discernible) lying above the gizzard; but I cannot say whether this is the nervous system or a gland. Owing to the presence of fat globules scattered all over the body, it is difficult to observe many details of structure.

BERNARD THOMAS.

POND DREDGING AND COLLECTING.

REPLYING to this query in the February number, I have much pleasure in giving some hints on collecting Infusoria, Rotifera, and Polyzoa, the result of my experience in this interesting pursuit.

The necessary apparatus are: a collecting stick, a flat bottle, a pocket magnifier, and a handbag with bottles.

Of all the various collecting sticks I have seen, I like none so well as the pattern supplied by Baker's, of High Holborn; it consists of a hollow walking-stick, with an inner rod which can be drawn out to increase its length, a small bottle, a hook, and a ring for the net, all of which can be screwed on to the stick.

The net should be made of dense muslin, with meshes small enough to prevent Rotifera and Infusoria going through, and yet allowing the water to run out freely. It is of some importance to have exactly the right material; as a guidance, I may mention that on holding my net to the window I can see the light through it, but no object with any degree of distinctness, nor can I read through it; when taking a dip the water runs through in about 5 to 10 seconds. The net should not be too long, nor too short; 5 in. is a proper length, by 6 in. across the ring; at the end is tied a small rimmed tube bottle of thin, clear glass, 3 in. long by 1 in. in diameter; a common bottle of thick glass would be of very little use, because minute objects cannot be seen through such a bottle.

The flat bottle was first introduced by Mr. Hardy, with the object of placing it under the microscope to examine its contents. I seldom use it in that way, because it is too inconvenient; the stages of microscopes are not large enough to hold it, and so it is mostly necessary to hold and move it with both hands, leaving none free to focus the microscope; I prefer to remove the weeds to a smaller trough. For use in the field and collecting, however, it is a most excellent contrivance, and quite indispensable. Every one knows how impossible it is to see an object clearly in a round bottle with a lens, whilst the flat bottle allows this to be done with the greatest ease. To make these bottles, get a thick piece of india-rubber, quite flat, about 6 to 6½ in. long and 2½ to 3 in. broad, and ⅝ or ¾ in. thick, then cut out an inner piece all round, except at the top, at ¼ in. from the edge, the result will be a ⊔-shaped piece of indiarubber, against each side of which cement, with Miller's cement, a piece of thin plate glass, and the flat bottle is complete. One or two more and smaller bottles can be made with the remaining piece of indiarubber. I strongly recommend the indiarubber to be ¾ in. thick, so as to make a deep bottle, otherwise the weeds, such as Anacharis, when put in with much difficulty, are pressed against the glass, which seriously interferes with their examination.

The pocket lens should not be bi-convex, as is usually the case, but plano-convex, and used with the plane side towards the object.

Having described the apparatus, I will now briefly mention how to use them.

For the purpose of collecting, the Infusoria and Rotifera may be divided into two groups: the free swimming and those that are attached to water plants. For collecting the group of free swimming forms there is no better device than the net; pass it through the water once or twice, and then hold it up and let the water run out—the condensed animals will enter the bottle quite at the last, like a cloud; it is therefore wrong to take a second dip before all the water has run out of the net. The ordinary dipping bottle, without net, is also useful and sufficient when the animals are abundant, but the net is certainly the best way of condensing them. At the same time, it is a mistake to condense pond-life too much, as the animals soon exhaust the food supply and die.

Having ascertained with the pocket lens that the dip contains something, the contents of the tube is poured into another bottle. Some collectors take with them a number of small bottles for this purpose, but I prefer to have two or three large ones, with only one or two small ones, to be able to isolate an object on the spot when required.

The group of attached Infusoria and Rotifera are best found with the flat bottle described above. Drag up with the hook a quantity of weed, and, selecting clean branches, but not the newest growth, place one branch after another in the bottle, which can then be carefully scrutinised with the lens. The tubes of Melicerta and Polyzoa, groups of Vorticella, etc., can at once be seen with the naked eye when present, and the good branches can soon be picked out. At the same time it must not be forgotten that some minute and very transparent animals, such as the Floscules, can rarely be seen even with the lens, and only the microscope at home will reveal all the captures. Experience alone can teach which of the branches are most likely to be prolific. As a general rule old-looking, but still sound and green, branches are the best. The water milfoil (Myriophyllum) is the best of water-plants to examine and collect, on account of the ease with which it can subsequently be placed under the microscope, Anacharis being a very awkward plant in this respect.

In placing a weed in the flat bottle never put in more than one branch at a time, otherwise the branches will only obscure each other, and render examination more difficult. For Polyzoa it is best to dredge up weeds from the middle of the pond or canal by means of a loaded hook and line.

Having selected the most promising branches out of various ponds, I place them all in the large bottles with the water to be taken home. Care must be taken not to put too many weeds in the bottles; in the first place, no one has time to examine so much

material, and secondly, such crowded bottles very quickly go wrong.

On arriving home, I turn out the contents of the bottles into three or four small window aquaria having flat and parallel sides. I would here strongly recommend the use of these window aquaria for keeping and examining pond-life; they save a great deal of time and trouble, and I find them quite indispensable. Mr. Watson, glass cutter and aquarium maker, of 161, Great Portland Street, London, makes them; 6 in. long by 5½ in. high, and 8 in. by 6 in., are two convenient sizes.

A number of objects escape notice in the ordinary round aquaria and bottles, but in these flat aquaria, which are not more than 1 or 1½ in. thick, every part can be seen and examined with the pocket-lens with great ease. On placing the aquarium in front of a window or lamp the free swimming forms will collect on the side nearest the light, and any one of them, even the minutest, can be picked up with a dipping-tube, provided with an indiarubber teat, acting as a syphon.

I need hardly mention the necessity of examining the objects as soon as possible, and not later than the day after their having been collected, as many organisms soon die in captivity, presumably from want of proper food. The life of Rotifers can be prolonged a little by feeding them twice a day with a green soup, made by crushing some Anacharis, or any other water weed, in a little water in a mortar. That they really eat this, can be seen under the microscope. After several days' captivity Rotifers look very white and hungry, biting at each other and trying to swallow each other's spines; but when a few drops of the soup are added to the trough, their stomachs very soon assume a more comfortable green appearance, becoming filled with little balls of chlorophyll.

In conclusion I would recommend microscopists to examine ponds and collect in winter as well as at the other seasons, for in my experience Rotifera and Infusoria are then, even under the ice, as abundant, if not more so, than in the summer months.

I trust these few remarks will be found useful to the younger collectors; I have found the methods described most efficient and time-saving, which is an important consideration to most of us who pursue this study as a recreation.

C. Rousselet.

RUDIMENTS.—A REPLY.

In discussing the advisability of retaining Mr. Darwin's use of the word "rudiment," it will perhaps be well to consider first the right application of the term. Either the organ so designated must be in an early stage of a future development, or in an inferior condition, compared with a higher standard.

Your correspondent Mr. Trevor-Roper attributes the latter sense to Mr. Darwin.

Now, as the term "rudimentary" can only be used in relation to a recognised standard of perfection, we are forced into the strange position of seeking for the perfection of our so-called rudimentary organs in the lower animals.

To those who have grasped the theory of development, this cannot but appear an anomalous proceeding.

The brain of man, so undeniable in its superiority, has perhaps alone escaped the stigma of being "greatly reduced from a perfect state," and to it is attributed solely the dominating position in which man now finds himself.

We have been told that our sight, hearing, smell, etc., are in a lower state of development than that of our earlier progenitors severally, and we have accepted the statement with unquestioning reverence. So with teeth, lungs, the down on the body, and indeed, almost every part of the human structure.

But we must ask if these assertions will bear examination, and whether our senses are inherited "in an enfeebled and rudimentary condition," as Mr. Darwin states of the sense of smell. I am inclined to doubt it, and before deciding hastily which is rudimentary and which is perfect, to weigh quality with quantity, to consider the economy of material, to find, if possible, the most comprehensive capacity in the least space.

And where is it to be found? Not in the compound eye of the dragon-fly, though it sees "equally well in all directions—before, behind, or laterally," nor yet in the far-sighted eyes of certain birds, that may excel in distance of vision, but in the organ of sight, which, one of our greatest anatomists tells us, "arrives" in man "at its highest perfection."

Put the dragon-fly or the bird into a gallery of pictures, and it is clear that delicacy of colouring and disposition of light and shade are lost upon them. Even the beauty of a landscape, or a fine sunset, excites no pleasurable recognition of harmonious tints.

Certainly, according to Mr. Darwin, wonderful changes have been wrought by the preference of the female Polyplectron for the ball and socket ocelli in the plumage of the male bird, but this is a supposition to be weighed; and even allowing this, no one, I suppose, would venture to compare, for delicacy of perception, the bird's eye with man's.

And again, with regard to the sense of smell. The bloodhound can track out and discover a runaway slave by the mere smelling of a garment, but has no perception of, or delight in, the varied scents of flowers, though carrion attracts him. The sense of smell is keen, but not refined.

It is quantity *versus* quality. How, under these circumstances, can the sense of smell be said to be inherited by us "in an enfeebled and rudimentary condition"?

A dog will hear distant sounds, and prick up his ears at the rolling of carriage-wheels, unperceived by us, but musical harmonies are wasted on him, or even disliked, and a new chord struck, or the song of a bird, is apparently unrecognised.

Again it is quantity *versus* quality. And if we are driven to defend the down on the human body, and even the os coccyx, we shall find the same argument to hold good. As a matter of fact, the fur of lower animals corresponds strangely to the rudimentary condition of our own finer covering. In a very early stage of man's formation, "the whole surface" of the body is "thickly clothed" with "wool-like hair," which Mr. Darwin himself recognises as "probably representing the first permanent coat of hair in those mammals which are born hairy."

What authority, then, has your correspondent for stating that the "down covering a man's body is certainly in a more rudimentary condition as regards the hair on lower animals"? Precisely the same may be said with regard to the os coccyx, which is known to project in an early stage.

Again, the tail is the rudimentary condition of the more perfect shortened formation, and corresponds to the appendage in lower animals.

While we are taught so carefully to trace in man's own individual development the picture of the great scheme of evolution—from the lowest of vertebrata to man, the highest—it is curious that this simple conclusion should have been overlooked. Are we still to term organs rudimentary, though we know that to increase them to dimensions of the lower animals would be to return to our own embryological condition, from which they had scarcely emerged?

The brain of an adult baboon, Mr. Darwin tells us, corresponds in development to the human brain in its early rudimentary condition. With these facts before us, we may surely infer that the ape represents to us a creature fashioned after the likeness of our own rudimentary state, and the same could be said with reference to other low forms.

Their structures are found to correspond to more or less rudimentary stages in man's individual early existence. If this be indisputable, the word "rudimentary" when applied to any part of a fully-developed human organism, is incorrect, and even where traces of a lower condition may be found, they should be regarded merely as an arrest of proper development from its own rudimentary condition.

A curious question arises from Mr. Darwin's theory of the process through which organs have passed in becoming rudimentary. He says, "Rudimentary organs have been slowly formed through continued disuse, acting by inheritance at a corresponding age, aided by the principle of the economy of growth, all under the control of Natural Selection." He explains the modification of an organ to a rudimentary state, through Natural Selection, etc., by the same slow processes that were required for its first development.

But the question is, Where are we to look for the stages of its first progress to development? If the fur of an ape were down developed to perfection, what is the history of its evolution, and on what ancient animal did rudimentary down first appear? The answer is as startling as apparent.

Supposing the simple brain of a savage, through use, inheritance, and Natural Selection, gradually evolves into the fully-developed brain of a civilised being, and then, in course of generations, through disuse, acting by inheritance, gradually loses its powers, the civilised man reverts to the savage.

Thus, if the down of the ape is found on man in its undeveloped vestigial condition, we must argue that man was originally the progenitor of the ape, and his down the rudiment of the futuie fur.

I cannot close this article without explaining that arguing on evolution ground only should I use such terms as "excrescences" and "deficiencies" with regard to organs in the lower animals, and I am prepared to defend the position, but my paper has already exceeded in length. To the non-evolutionist every group is perfect in its kind, and for its environment.

N. F. L.

NOTES ON FOSSIL CONCHOLOGY.

THE subject of these notes, is, I may say, a vast and almost an inexhaustible one, and it is very difficult to know where to begin; therefore, I propose to deal, in the first place, with the genus Planorbis.

The Planorbes are freshwater molluscs, and abound principally in still water, although, occasionally found in streams. The animal is elongated, slender, and rolled up; the head is furnished with two long contractile tentacles, at the internal bases of which eyes are placed; the orifices are on the left side; the organs of generation distinct.

General character.—Shell discoidal; spire depressed; volutions apparent above and below; aperture lunate, crescent-shaped or sub-quadrate, impinged upon by preceding volution; outer lip generally thin, sharp-edged, columellar lip spreading over the body whorls. No operculum. All fossil remains of this genus are found in fresh water, or transition formations.

PLANORBIS, Geoffroy.

Planorbis obtusus, Sowerby. (Fig. 26, 1, *a*, *b*.)—This very pretty shell has a smooth, shining, nearly polished surface; it is depressed, nearly flat on the upper side, and slightly concave beneath. The volutions are four or five in number, separated by a deep suture, slightly convex on both sides, but rather more compressed on the under side than the upper, obtusely rounded at the periphery, and each nearly half-

concealed by the succeeding volution. The aperture is very oblique and bluntly heart-shaped. In the general form and rounded whorls, this species resembles *P. sparnacensis*, but the whorls are not so numerous, and the aperture is more oblique. The lenticular form and angulated margin of *P. lens* will prevent its being confounded with that species. *Planorbis obtusus* is found in the upper eocene formation, at Sconce and Headon Hill, Isle of Wight, and at Hordwell, Hants.

Planorbis euomphalus, Sowerby. (Fig. 26, 2, *a. b.*) —This well-known species, which appears to be confined to the fresh-water formations, is equally distinguished from the other Planorbes. It is a large discoidal shell, nearly flat on the upper face, and presenting a wide and deep umbilical cavity beneath; the six or seven volutions of which the shell is formed are flat or nearly so above, concave below, and each but slightly embracing the preceding volution; the apex is concealed by the volution of the whorls. A clearly defined and rather acute angle, almost forming a keel, runs round the periphery of the shell, and separates the upper from the under disc. This angle is always very conspicuous in the young shells, but as they approach maturity it becomes more and more obtuse, and frequently disappears; the whorls then assume a transversely oval form, approaching nearly to that presented by *P. rotundatus*. On the under surface, the inner margin of the whorls is bent rather suddenly towards the preceding whorl, and presents, in consequence, an obtuse angle, which runs round and defines the umbilicus. Transverse lines of growth are very conspicuous; and frequently the surface of the shell also presents more or less numerous concentric raised lines, some of which are larger and more prominent than the rest. The aperture is subtrigonal, slightly impinged upon by the preceding volution, and very oblique. This species is found in the fresh-water limestone of the Upper Eocene formation, at Headon Hill, Isle of Wight.

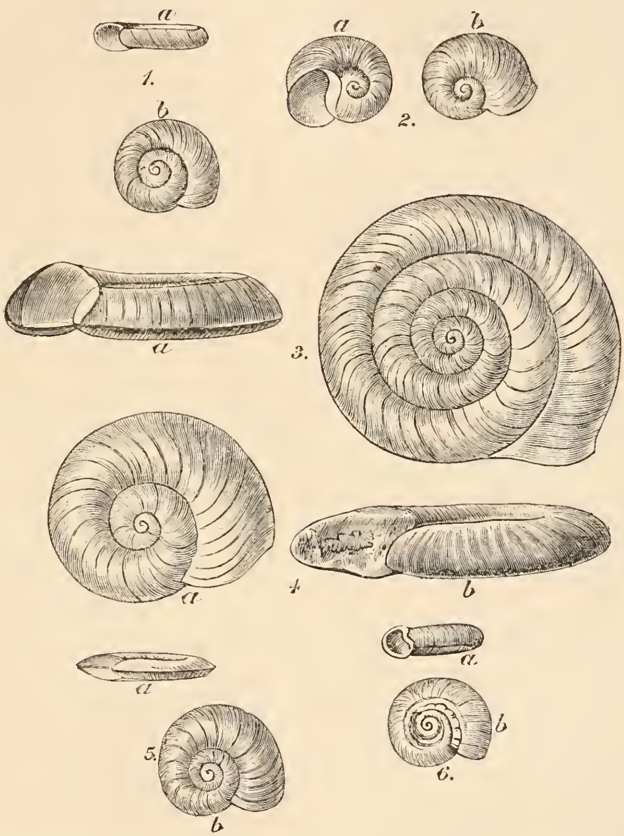

Fig. 26.—Fossil fresh-water shells. 1. (*a* and *b*) *Planorbis obtusus*; 2. (2) *P. platystoma*; 3. (*a*) side view of adult shell; (*b*) view of upper disc of *P. euomphalus*; 4. *P. discus*; 5. *P. lens*; 6. *P. elegans*.

Planorbis rotundatus, Brard.—A rather large shell, formed of six or seven nearly round volutions, separated by a deep suture, and each slightly impinged upon by the preceding one; the volutions are flatly convex on the upper side, convex beneath, and (like those of *P. euomphalus*) present an angle running round the inner margin near the umbilicus, which as the shell matures becomes almost obsolete.

The upper face is nearly flat, while the under side presents a moderately deep and wide concavity. The aperture is transversely oval, and but slightly oblique. The striæ of growth are very conspicuous; and occasionally, although very rarely, the shells present fine concentric lines, similar to those which characterise *P. euomphalus*. In this species, however, the lines are finer and more crowded, and seldom extend beyond the first three or four volutions. The fossil remains of this species abound in the Upper Eocene beds at Sconce and Headon Hill, also at Hordwell, Hants.

Planorbis discus, Edwards. (Fig. 26, 4, *a. b.*)—This well-marked species appears to be peculiar to the fresh-water formation at Sconce, Isle of Wight. It is a much compressed discoidal shell, nearly flat on the upper side and deeply hollowed out below. The five or six whorls of which it is formed enlarge rapidly, and each is slightly embraced by the succeeding one; they are much flattened above, slightly convex below, and obtusely rounded at the outer edge. In the young shell, the inner margin is bent rather abruptly towards the preceding whorl, and presents an obtuse angle which defines the umbilicus, similar to that presented by *P. euomphalus* and *P. rotundatus*. As the shell becomes matured, the under side assumes an almost regularly convex form, and the angle becomes obsolete. The aperture is oblique, and of an elongated heart-shape. Casts of this shell occur in great abundance in the fresh-water beds of the Upper Eocene formation at Sconce, Isle of Wight.

Planorbis digyratus, Edwards.—The present, like the preceding species, is apparently confined to the fresh-water formation of Sconce, but is not so plentiful as *P. discus*. It is a moderate-sized shell, formed of four rapidly-increasing whorls, somewhat convex above, and rather acutely angulated round the inner margins on the under side, just above the umbilicus. The periphery, near the upper surface, presents an obtuse angle, from which the whorls shape rather abruptly towards the umbilicus, assuming in consequence a subtrigonal form. The aperture is slightly oblique, and bluntly obcordate in consequence of its being impinged upon by the preceding whorl. The umbilical cavity is deep, but not very wide.

This species is, in the fossil state, ordinarily found as casts only, in the Upper Eocene beds of Sconce, Isle of Wight.

Planorbis platystoma, Wood. (Fig. 26, *b*, *a. b.*)—A small smooth shell, formed of three rapidly enlarging whorls, each embracing about one-half of the preceding one; the whorls are rounded, equally convex above and below, but slightly compressed on the upper side. The apex is wholly concealed by the involutions of the whorls. The aperture is wide, oblique, and bluntly heart-shaped; the upper side is slightly concave, and the under presents a wide and somewhat deep umbilicus. *Planorbis platystoma* is found rather abundantly in the Upper Eocene beds at Sconce, Headon Hill, and at Hordwell, Hants.

Planorbis lens, Brongniart. (Fig. 26, 5, *a*, *b.*)—This species is a small lenticular shell, slightly concave on each side, but more so on the upper; the whorls are four in number, each embracing nearly one-half of the preceding one; they are also slightly convex on both sides, but more so above than beneath, and angulated round the periphery, a little below the middle of the whorl. The aperture is heart-shaped, but not very oblique. The fossil remains of this species are found at Headon Hill, Isle of Wight, and Hordwell, Hants, in the Upper Eocene formation.

Planorbis tropis, Edward.—A minute shell, compressed and polished, and slightly sunk round the apex, and widely but not deeply umbilicated; the four or five volutions, of which it is composed, are convex above and flat beneath, and compressed near the outer margin so as to present a prominent keel, which runs round the periphery a little below the middle of the whorl. The whorls embrace one another about one-half of the preceding one; the aperture is very oblique, and of a longish heart-shape.

This species seems to be peculiar to the Eocene beds at Hordwell, Hampshire.

Planorbis hemistoma, Sowerby.—*P. hemistoma* is a minute, smooth, depressed shell, concave on the upper side, almost flat beneath and compressed, almost angulated at the periphery, above the middle of the shell. The whorls do not exactly embrace one another, although the upper surface is partly concealed by the succeeding whorl; the inner margin is bent abruptly towards the apex, and presents a conspicuous angle, which runs round the cavity. The aperture is oblique and subtrigonal, having the lower margin rounded. This species somewhat resembles *P. elegans*, but is smaller and more compressed.

Fossils of this species are found in the Eocene formation at Hordwell, Hants; Plumstead, Sundridge, and Rotherhithe.

Planorbis elegans, Edwards. (Fig. 26, 6, *a*, *b.*)—This little planorbis is found in great abundance at Headon Hill, Isle of Wight. It is a small polished shell, deeply but not widely hollowed out on the upper disc, and slightly concave, almost flat beneath. It is composed of four or five volutions rounded on the periphery, marked by conspicuous lines of growth nearly perpendicular to the axis, very convex, and presenting a sharpish angle running round the inner margin on the upper surface, and but slightly convex beneath; each volution embraces a third of the preceding one. The aperture is heart-shaped, and slightly oblique. This species is found in the Eocene beds at Headon Hill, Isle of Wight, and at Hordwell, Hants.

Planorbis biangulatus, Edwards.—A depressed, small shell, slightly and nearly equally hollowed out

on both sides, but rather more so above than beneath. It is formed of four or five volutions, convex on the upper side, and obtusely angulated round the cavity, in consequence of the somewhat abrupt inflexion of the inner margin towards the preceding volution. The periphery presents two angles, one rather obscure near the middle, the other more prominent, runs round the margin of the lower disc. The aperture is slightly oblique, and of a short heart-shape, but irregular in its form, owing to the greater convexity and the angulated inner margin of the upper surface of the whorl. *Planorbis biangulatus* is found in a fossil state, in the Eocene beds at Hordwell, Hants.

Planorbis Sowerbyi, Bronn.—This is a small depressed shell, slightly and nearly equally hollowed out on both sides; but the umbilical cavity is deeper of the two. The volutions are three or four in number, enlarging rapidly, convex above and flat beneath, and having a sharpish keel on the periphery. The whorls are much concealed, each embracing about half of the preceding one, and the aperture is very oblique, and of an elongated heart-shape.

Found in the Upper Eocene beds at Sconce, Isle of Wight. This species is believed to be very rare.

GEO. E. EAST, JUN.

NOTES ON THE EIGHTH EDITION OF THE LONDON CATALOGUE OF BRITISH PLANTS.

By ARTHUR BENNETT.

THESE notes are put together for the purpose of aiding those botanists who have felt that the changes introduced into the 8th ed. of the "London Catalogue of British Plants" need some explanation more than could be given in that list. I propose to take the 7th and 8th editions and go through them *seriatim*, noting the changes in name, and here and there introducing such notes as seem needful. I have awaited the completion of Mr. B. D. Jackson's "Observations on the Nomenclature of the 8th ed. of the London Catalogue," concluded in the November number of the "Journal of Botany"; this will explain the somewhat late appearance of these notes.

Thalictrum majus a is sunk under *minus c. flexuosum* in 8th ed. *b. Kochii* becomes a var. under *saxatile*, but it is almost certain we have not the true Kochii of Fries. What the *T. saxatile* of Cambridgeshire is, I cannot yet ascertain; I have grown it for three years; dried a series, and twice sent it to Continental authorities: in both cases they will not give it a name. Probably the No. 4 and var. *b* are really *T. Jacquinianum*.

The Batrachian Ranunculi are still far from satisfactory, and yet need continuous study. No. 18, *d. penicillatus*, Hiern, should be taken out; it is really only *pseudo-fluitans*, with floating leaves. I consider that 16*c* should be taken out, as I do not believe the Scotch plant is the *confervoides* of Fries, but would rather place it under 15.

32, *Ranunculus sardous*, Crantz (not with a capital S), is *R. hirsutus*, Curtis, and an earlier name.

35, *R. flabellatus* var. represents 32, *R. chærophyllus*, of the 7th; Nyman saying that our Jersey plant is not the plant of Linnæus. The var. should properly read "Europæus," though Nyman prints it as the 8th.

50. At the time the Catalogue was printed, it was uncertain whether our var. *intermedium* was the true plant of Ledebour; since then, Dr. Caspary has pronounced plants, from several stations in Scotland I sent him, to be the true plant; so "Led." should be added, and "auct. angl." taken out.

59, *Glaucium flavum*, Crantz, takes the place of *G. luteum*, Scop.

61, *Rœmeria hybrida*, DC., was accidentally omitted from the 7th ed. It is the rare cornfield plant occurring near Swaffham, in Cambridgeshire.

62*b* should have the authority "Mill," instead of "DC."

76*c* occurs but rarely, but is British.

85*bis* will be *Arabis alpina*, L., discovered in Scotland last year (1887).

88, *Arabis sagittata*, is *A. hirsuta*, Br., of the 7th ed.; it has a var. *b* added, found in Ireland and Sussex.

96, *Cardamine bulbifera*, is *Dentaria bulbifera*, of the 7th ed., but the authority should be "R. Brown," not "Syme."

105 should have the authority DC., not "Reich."

109*b*. *Hortii*, Syme, is a var. found by the Rev. — Hort; in some parts it is the commoner form.

112, *Thaliana* should be *Thalianum*, Gay.

120 should be *perfoliatum*, Crantz.

135*b* is a form often mistaken for *D. tenuifolia*.

143, *Lepidium Smithii*, will become *L. heterostylum*, Benth., and *b. canescens*, Gren. et Godr.

153*b* is a form gathered in Shetland and Fife, probably elsewhere.

161 is *H. canum*, Dunal, of the 7th ed.

162 is *H. vulgare*, Gærtn., of the 7th ed.

165*b* should have "auct." instead of "Besser," as the authority.

172 is *V. stagnina*, Kitabel, of the 7th ed.

179 is *Polygala depressa* of the 7th ed. *b. ciliata* is a form gathered on the Gogmagog Hills, in Cambridgeshire.

181, alter the authority to "Linn."

191*b* is a form found in Lancashire and elsewhere.

192 is *Silene inflata*, Sm., of the 7th ed.

196, the census of counties should be "58," and added to "*a. anglica*."

209, authority should be "Scop."

211 is *Mœnchia* of the 7th ed.

217*c* should be taken out and added o 218, as var. *b. Edmonstoni*, Beeby.

Cerastium arcticum, Lange, is certain for Snowdon ! Shetland ! Aberdeen !

226 should have "Retz" added as the authority, not "Ehrh."

230 is *Alsine rubella* of the 7th ed.

231 is *A. uliginosa* of the 7th ed.

237 is *Honkenya peploides* of the 7th ed.

238 is *Cheleria sedoides* of the 7th ed.

243 is *Sagina saxatilis* of the 7th ed.

"Lepigonum" is used instead of "Spergularia" of the 7th ed., the terminations of the specific names being altered.

251 *b* is a rare var. found near Plymouth.

255, the var. should stand *a. repens*, Pers.
b. erectus, Pers.

264 is *Hypericum dubium* of the 7th ed.

265 is *H. tetrapterum* of the 7th ed.

267 *b* is a var. found in the Channel Isles by Dr. Boswell.

276 is a species found in the Scilly Isles of late years.

281 should be *M. pusilla*, With., not *borealis*, Wallr.

282, alter authority to "Hudson."

286, alter authority to "Roth."

290 *b*, alter authority to "Schübl."

292, alter to *G. versicolor*, L.

299, alter authority to "Linn."

312, alter to *biflora*, Walt.

The census "99" should be transferred from 327 to 328 *b*.

335 *c*, alter authority to "Desv."

336 should be *M. arabica*, All.

Melilotus is a troublesome genus, "with name alterations."

338 should be *M. officinalis*, Lam., 7th ed., No. 318.

340, *arvensis*, Wallr., 7th ed., No. 320.

341, *indica*, All. ; 7th ed., *M. parviflora*.

343 *b* is a var. for Scotland and Norfolk !

345 should be *ochroleucum*, Huds.

346 should be *squamosum*, Linn.

363 is *T. minus*, Relh., of the 7th ed.

368 is *L. major* of the 7th ed.

372, specific name with a small "h."

380 should be *O. viciæfolia*, Scop.

392, alter authority to "Linn."

405 should be *L. montanus*, Bernh.

407 should be *P. spinosa*, Linn.

408, alter authority to "Huds."

The census "112" to "413" is an error.

486 is *P. minor*, Gilib.

487 is perhaps *P. rubens*, Vill. ?

488 should be *P. silvestris*, Necker.

495 should be *P. palustris*, Scop.

497, alter authority to "Scop."

498 *b* is *hybrida*, Willd.

500 should be *A. argentea*, Don.

504 should be *P. polygamum*, Waldstein and Kitabel.

The roses need little explanation, but

510 *g* ought to be placed under 508 as var. *d*.

513, *agrestis*, Savi, is practically 467 of the 7th ed.

416 to 476, *Rubi*. I make no comments on these difficult plants, feeling assured that the arrangement and nomenclature is only in a transition state.

528 represents 479 *a* and *b* of the 7th ed.

533 is 472, 7th ed.

534 *b* and *c* are two vars. additional to 7th ed.

535, alter name to *C. integerrimus*.

539. Here the name itself represents the 535 *a* of the 7th ed. My own leaning would be to retain in this case *a*. either as "*crenata*," or *a. genuinus* in all cases where the type-form may cause confusion by not so being represented. Still, it really amounts to want of taking care to urge that any difficulty can result from my writing and asking a correspondent for 539, 8th ed. ; naturally, if I wanted other than the type, I should add *b* or *c*, as the case might be.

541. Here *c* may well represent 537 *c* of the 7th ed. ; the alteration in name really means nothing, as one might add a dozen varieties (if of any use) from old books.

548 and 550. Professor Babington combines these two plants ; the mistake in the 8th ed. is putting 549 between them ; the numbers really ought to be transposed : 549 to 550, then 550 to 552 would represent a graduated series.

562 should be *S. roseum*, Scop.

571, alter authority to "Linn."

576 *b* is a form with a decided stem, which I have seen more developed in *rotundifolia*.

582. Here the 509 *b* of 7th ed. is omitted ; it is really only a *f*, differing in the direction of the fruit-lobes.

587 *b* (authority should be "Guss."), is a *f*, with very short hairs closely packed over the surface.

593 has two vars. added—*b* and *c*. Hausknecht, in his monograph of the genus, places them as hybrids, giving several others as British ; this is a genus that will repay collectors, if good specimens with roots are gathered.

(*To be continued.*)

REVELATIONS CONCERNING THE BASS (*LABRAX LUPUS*).

By W. August Carter,
Of the National Fish Culture Association.

During the existence of the late South Kensington Aquarium, I made some observations upon the bass (*Labrax lupus*), specimens of which were exhibited there measuring two feet in length and under. They were captured off Southwick, near the shore. The larger specimens attracted considerable attention from visitors to the late Colonial and Indian Exhibition, where they were regarded by many persons, uninitiated in things piscatorial, as salmon.

This erroneous impression is commonly shared, and can readily be accounted for by the fact of the *tout ensemble* of the bass, resembling closely that of its lordly *confrère*. On this account, I have known unscrupulous fishmongers to dispose of the former to unwary customers in place of the latter.

The habits of bass afford a very interesting study. Their dignified appearance when full grown earns them the respect and admiration of all visitors to

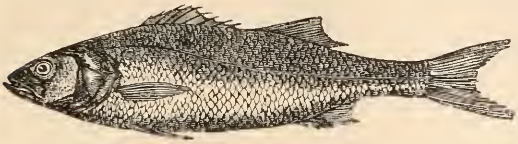

Fig. 27.—The Bass (reduced).

aquaria where they locomote backwards and forwards, unconscious of the admiring glances bestowed upon their silvery forms. But, as we are well acquainted with their characteristics, I shall proceed to record the result of my observations upon their habits and proclivities, which point conclusively to the extreme hardihood of their constitutions.

In confinement bass are naturally not so voracious as

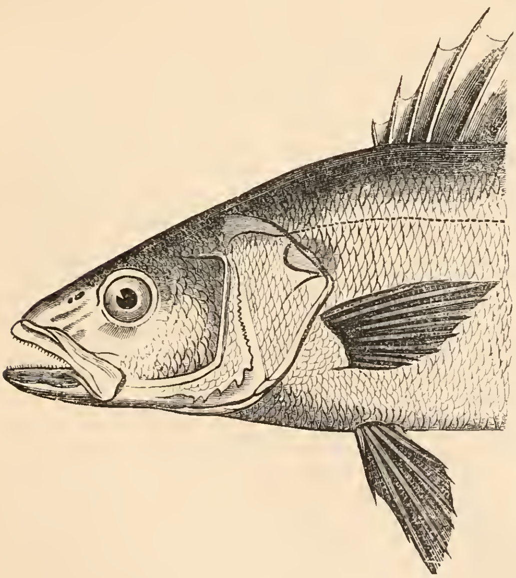

Fig. 28.—Head of Bass.

in their normal sphere, but their appetites are nevertheless very keen when living under artificial conditions. On first being admitted to the aquarium they abstain from food entirely, as they also do at certain seasons of the year. When once induced to feed at the outset, they exist many years in an artificial state, but if at the end of eight days they reject their food, death ensues shortly afterwards. They can be accustomed to a varied diet, including meal, but mussels is the best kind of food upon which to feed them in captivity, onisci and crustacea, their natural sustenance, being difficult to procure regularly. They are capable of domesticating themselves to a variety of conditions, and changing their nature and food as well as the coloration of their body. In captivity the irides become more silvery, and the bluish tints upon the back lighter in hue.

It is stated that bass thrive under fluviatile conditions. This, however, all depends upon circumstances. On several occasions I turned a few fish into fresh water, but did not succeed in maintaining them longer than six days. They became languid and thin in appearance, refusing to touch the various foods that I placed in their tank. In brackish water the case is different; they frequently repair thither in their natural state when following their prey. There is no doubt that if the ova were hatched, and the fry reared in fresh water, they might be permanently naturalised thereto, in fact we are told by Columella that this was done by the ancient Romans with success; but on the other hand, it would be extremely difficult to acclimatise them to a fluviatile existence after being reared in saline waters.

I find that bass possess extraordinary vitality and powers of endurance. They are able to live more than three weeks in stagnant water, unlike their relation the *Perca fluviatilis*, which requires plenty of oxygen. The respiratory organs of the bass are of a high order, for until the last few days of their death under the condition described, they did not rise to the surface of the water to obtain air, which is the practice of most fish when deprived of oxygen. The gill-openings of bass are small, which may account for their being able to support life so long upon a meagre amount of oxygen. During their existence in stagnant water the bass moved less actively, but otherwise there was no indication of loss of vitality.

Another proof of their powers of endurance is forthcoming in the following facts. I have noticed large specimens of bass sicken for death eighteen days before the event took place. An instance of this came before me a short time since, upon the arrival of several of these fish at South Kensington. Finding that they abstained from food, I examined them carefully, and by comparing their movements with other specimens, I noticed they seemed very weak. Their motion in the water was indefinite: they sometimes moped in corners of the tank and did not disport themselves upon the shingle at the bottom thereof, as their comgeners do when in good health. At the end of the first week they exhibited a tendency to change their attitude in the water from horizontal to vertical, until they rested upon their tail. This was a sure sign of speedy death, but they lingered on, nevertheless, remaining stationary in the water, but on no occasion partaking of food. I continued to watch them closely for two weeks longer, thinking there might be a possibility of their recovery, but my hopes were

not realised, one being found apparently in a lifeless condition at the bottom of the tank one morning at the end of the three weeks of its indisposition. On examination, I found no signs of life in it, and as it was required for the purpose of preservation in spirits, I desired the attendant to place it in a dry receptacle for six hours before operating upon it, in order to preclude the possibility of the slightest particle of animation being present. At the end of that time the fish was removed, and having filled a glass jar with spirits, I commenced to place the fish therein, head foremost.

No sooner, however, did it come in contact with the spirits than it revived and wriggled about violently in the jar, insomuch that it upset the liquid. This incident fully confirms the result of the experiment tried some time since by Mr. W. Oldham Chambers, F.L.S., who restored carp on the point of expiration by the means of brandy. In the case before us we have a remarkable evidence of the hardihood of fish, serving to show that, although they may exhibit every sign of death upon outward examination, there is still animation within for some time after they grow stiff, which is capable of revivification, by the potency of a stimulant. On this account every effort ought to be made by anglers and others to take sudden and effective methods of depriving them of animation, instead of allowing them to linger in the pains of death on being captured. The spark of life that was accidentally kindled into a flame by means of the spirits infused into the bass, must have indeed been small, considering the length of time the fish had been kept out of water.

In further support of my statement respecting the hardihood of bass, I would mention that they are capable of existing in water having a temperature of 30°. This is noteworthy, as they disappear from view in their natural state during the winter, retiring into the deep water of warm locations. In the summer they emerge from thence, and approach the mouths of rivers where they usually deposit their ova. Aristotle, who was doubtless a great authority on fish, mentions that bass breed twice in one year; this statement, however, is not correct. Doubtless it was inspired by the fact that bass sometimes yield their ova in two or three instalments, which I have known them do during a period covering two months. Again, considering the large number of ova extruded at one time, it would seem impossible for them to repeat the supply twice in a year; besides they require a warm temperature in which to spawn, therefore that they could not breed in the winter as well as the summer.

It is to be regretted that the bass does not enter more freely into our list of dietaries. Provided it is quite fresh its quality is very good, but when three days old its flavour becomes impaired, being extremely oily. If, however, it was caught in larger numbers I feel sure it would become popular as a food fish. In the time of the ancient Greeks and Romans it was highly esteemed as an article of food, and attracted great attention in the writings of Aristotle, Ovid, and Pliny, while in the mosaic group of fish disinterred at Pompeii it is prominently depicted. One cause for their scarcity in the market, is the difficulty that exists in capturing them. There are few fish more crafty than the bass, and few requiring more elaborate fishing-engines or more skill in manipulating them. Like the grey mullet, they can best be taken by working the seine-net near the shore; even then they effect their escape in a most cunning manner. They are evidently able to discern the presence of the net and avoid it accordingly, judging by the way which they dive beneath it to evade capture. Bass, therefore, are not popular with fishermen, who admit they are too wary for them, and cost more trouble and expense in catching than they are worth. Hence the paucity of the supply in the market, and the glut in certain parts of the vasty deep. For a marine game fish commend me to the bass, which affords almost as much sport as its dusky fluviatile congener of the United States. From rocks, boats or pier-heads, they may be taken by the means of rod and line, and I have, on various occasions, witnessed them landed at flood tide by means of an artificial dead or live bait.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

SNOW IN AUGUST.—We had some curious weather last year in England, but the meteorological bulletin of the Royal Observatory of Brussels beats our record. On the 10th of August, at about 3.20 P.M., there was a fall of snow mixed with rain at Turnhout, in Belgium, and on the 3rd and 4th August there were white frosts at Maldegehm, in Flanders. The same on 12th, in the south-east of Belgium. There was a very severe frost on 7th July, which did considerable damage to the crops over a large area of country.

The Steering "Instinct."—The migration of birds across the sea has suggested many speculations, some of them rather wild. How do they steer? Formerly there was no difficulty in solving this or any other problem of the kind. They were "guided by instinct." Instinct, like Mesopotamia, was a "blessed word" among the old naturalists; it covered every difficulty. Subsequently "inherited memory" was modestly suggested, and recently it has become almost as blessed as instinct in settling everything. In his day Jack Falstaff said, "instinct is a great matter; I was a coward upon instinct." If he were living now he would say, "heredity is a great matter; I was a coward upon heredity."

I have already advocated a much simpler explanation, viz. that the birds select narrow channels, and

having great powers of vision, and the means of taking in a very large field of view, simply see the sunward land on the other side, and fly towards it. The difficulty here is merely a question of degree, whether or not some of the channels actually crossed are too wide for this. In "Nature," November 3rd, of last year, is a letter from Mr. Warde Fowler, describing the migration of swallows on the south coast of England. This shows that they take long journeys from west to east in search of a narrowing part of the channel.

An officer of the German Navy, Captain Sebelier, has recorded some facts that lessen this difficulty. The islanders of the Marshall group in the North Pacific Ocean make long voyages in their canoes towards islets that are far beyond their vision-reach, and do this without any astronomical aid. From twenty to fifty canoes start together and keep within signal-reach of each other, and thus a large extent of sea is under survey. They advance until the islet is sighted by one or the other of the canoes. When such is the case, that one takes the lead, and the rest follow in accordance with the signal.

That birds do signal each other is well established. May not the migrating birds guide each other on this principle? The Marshall islanders rest at nightfall, but the birds fly so rapidly that daylight is long enough to serve them fully in covering the widest of their transmarine journeys. Nevertheless they sometimes perish. I witnessed an example of this on the coast of Greece, near Cape Matapan. Had sailed from Malta in a small schooner in the spring, and encountered a severe gale. A number of swallows and martins settled in the rigging after the gale, and were so exhausted that they made no attempt to escape when we took them in our hands. They all died in spite of our attempts to aid their recovery. They appear to have been blown from their course by the gale.

CAPRICES OF LIGHTNING.—We are told that an electric discharge follows the line of least resistance, and lightning conductors are placed accordingly to entice the discharge to follow an easy and harmless route. It does so usually, but not always. In the "Bulletin de la Société Vaudoise des Sciences Naturelles" (No. 95), M. H. Dufour narrates some remarkable exceptions. A storm coming from the West passed over some gasworks and tall poplars without any discharge, but wrecked a house lying just below them on the leeward side. Again, at Penthalaz, the spire of a church was spared, while a house near to it was struck. It may be that in these and similar cases the cause of the discharge was nearer to the horizontal than to the vertical, not from a cloud to the earth, or *vice versâ*, but between two beds of air or vapour lying at nearly the same elevation. We may frequently *see* discharges taking place between two clouds that are both at nearly the same elevation, and it is therefore not improbable that similar differences of potential may exist between columns of air near the ground at times of violent atmospheric disturbances.

THE RAISING OF EGYPTIAN MONOLITHS.—As some of these reach a height of one hundred feet, and weigh some hundreds of tons, the question of how they were raised opens many speculations. One of the most recent of these is by M. Arnaudeau, who suggests that the obelisk being placed horizontally with its base towards the pedestal, a circular water-tight enclosure was raised equal in height to the obelisk. Then blocks of wood or other floats were fixed to the upper part of the obelisk and water was let into the enclosure, whereupon the monolith rose gradually to the upright position, and, being partly sustained by the water, was easily handled for adjustment on its intended base.

This reminds me of a contrivance attached to Lord Rosse's great telescope at Parsonstown, with which I was not acquainted until I saw it in operation, and which may be equally new to most of my readers. The speculum at the object end is of course very massive, and demands a counterpoise. This is obtained by hanging heavy weights from the eye end. But the leverage at which these weights act necessarily varies according to the inclination of the telescope. When it is pointed nearly to the vertical this leverage is very short, and it increases as the great tube turns towards the horizontal. Therefore, in this case, the counterpoising weight requires gradual diminution. This is obtained by the aid of a deep water-trough, into which the counterpoise weights gradually dip as the eye end of the telescope descends, and thus their weight is first partially sustained by the water as they dip into it, and then fully sustained when they rest on the bottom. One weight succeeds another thus, and by skilful adjustment of this gradual lightening, the balance of the great tube is maintained at all inclinations.

FREEZING WATER-PIPES. — "Nature" tells us that the architect who designed the new Medical School in Paris took so little pains about the distribution of the water-pipes that in very cold weather the laboratories for physiology, bacteriology, experimental pathology, &c., are wholly deprived of water. It is by no means necessary to cross the Channel to find examples of similar ignorance of the elementary principles of science among architects and builders. Now that there are so many empty houses in and around London and other great towns, and the competition for tenants is consequently very keen, the remedy is in the hands of intending tenants. If they firmly refuse to occupy any house the water-pipes of which are imperfectly protected from exposure to frost, and unprovided with the means of emptying them when frost is threatened, a change will soon

come about. The expense, mischief, and annoyance due to the bursting of water-pipes in a house is a serious tax, and should therefore be appraised as a heavy discount on the rental value of the house.

THE PHILOSOPHY OF HAIR-CURLING.—According to a contemporary, "it is not generally known that the reason why hair curls when wound on a hot iron, is that the moisture on the side next the iron being evaporated by the heat, the cells in that part approach each other more closely, and this shrinking of one side causes the bend or curve." This explanation affords presumptive evidence that the writer is a young man, or at least young compared with myself. He was not flourishing when I went to the dancing-school, and under the mandate of imperative custom had to go to the hair-dresser before presenting myself at the "assembly-room." They did not enforce hair curling on "breaking-up" day at his school as at the "Academy for Young Gentlemen" where I was taught to regard all books as instruments of torture, and to hate them accordingly. Had he endured such experience he would have known that each particular hair was doubly or trebly twisted, and on completion of the twisting a comb was inserted between the curl and the scalp, and the hot tongs held for some time with the twisted hair in position, quite long enough for the heat to freely pass through a hair's breadth. The force of the final twist which I so painfully remember was a result of the operator's belief, founded on much experience, that the whole operation depended upon a certain degree of mere mechanical rigidity of the material operated upon which induced it to retain for a time any form into which it was forcibly restrained and maintained while hot. The recondite explanation above quoted does not cover the action of cold curl papers.

THE MUTABILITY OF SPECIES.—In the Transactions of the Manchester Microscopical Society of last year is narrated (in the President's Address) an interesting account of change of species. In the neighbourhood of the Black Sea were a couple of lakes separated by a dam. The larger and higher of these contained 4 per cent. of salts, and in it *Artemia salina* were living there in great quantity. The smaller and lower lake held in solution as much as 25 per cent. of salt and contained no artemiæ. The dam between the two lakes was accidentally burst in 1871, the lower lake was thereby greatly increased in size, and its salinity reduced to about 8 per cent. Many of the artemiæ carried down with it died and many survived. The lower lake now began to evaporate, and the strength of the solution to increase. In the summer of 1872 the salinity had risen to 14 per cent., in the summer of 1873 to 18 per cent., in August 1874 to 23½ per cent., and in September of the same year to 25 per cent. A Russian naturalist, Schmankewitsch, fished out and examined specimens of the artemiæ at intervals during the three years, and found that as the strength of the solution increased, the artemiæ gradually lost the specific characters of *Artemia salina* and acquired those of *Artemia Mülhauseni*. The tail lobes gradually became shorter, and the number of setæ diminished, until at the end of the third year all the artemiæ were converted into typical *Artemia Mülhauseni*. The reverse experiment has been performed artificially. By gradually diluting the water *Artemia Mülhauseni* were reconverted into *Artemia salina*, and, by pushing the dilution still further, not merely a specific, but a generic change has been effected, the latter being converted into the fresh-water genus Branchipus which is of larger size and in many respects different.

I remember well when the immutability of species was a sacred dogma, one of the articles of faith of the orthodox naturalist. I had some warm debates on the subject just after the publication of "The Vestiges." If an instance like the above was brought forward and could not be denied, the whole fabric of previous specific definition was abandoned, and the new species was described as a "variety." One such instance which I remember was that of our common wheat, which was shown to be derived from another genus. Accordingly generic definition was abandoned and specific differences bounded over in a wide leap, the two genera were converted into mere varieties. Thus the controversy became closed by the verbal device of defining a species as that which cannot be changed into another species, *ergo* species are immutable.

What extraordinary change has since occurred among naturalists! They themselves are no longer of the same species as formerly, and have even changed their generic name to that of "biologists." In contemplating this example of scientific evolution, let us not lose sight of the moral it conveys. Let us struggle to avoid all scientific dogmatism, and to free ourselves from the fetters of mere fashion in science, or what I have ventured, very impertinently, to describe as "scientific millinery."

ASTRONOMY AND METEOROLOGY.

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

AT the meeting of the Royal Astronomical Society, held on the 13th of January, Father Perry read a paper on the state of the solar surface during the year 1887, and gave an account of observations which he had made on 259 days at the Observatory of Stonyhurst. The number of days he had been able to observe the sun proved that the weather had been exceedingly fine in that part of England.

From January to April, 1886, the solar surface was free from sun-spots; but at the beginning of May,

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

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿ .	4	6 15M	0 1A	5 47A
	11	5 44M	11 13M	4 42A
	18	5 23M	10 42M	4 1A
	25	5 10M	10 27M	3 44A
Venus ♀ . .	4	5 35M	10 5M	2 35A
	11	5 29M	10 12M	2 55A
	18	5 20M	10 18M	3 16A
	25	5 12M	10 24M	3 36A
Mars ♂ . .	4	9 45A	3 7M	8 25M
	11	9 15A	2 39M	7 58M
	18	8 43A	2 8M	7 28M
	25	8 6A	1 34M	6 57M
Jupiter ♃. .	4	1 13M	5 27M	9 41M
	11	0 48M	5 1M	9 14M
	18	0 21M	4 34M	8 47M
	25	11 49A	4 2M	8 19M
Saturn ♄. .	4	1 20A	9 18A	5 20M
	11	0 51A	8 49A	4 51M
	18	0 23A	8 21A	4 23M
	25	11 54M	7 53A	3 56M

1886 (which seemed at the time to mark the end of minimum period), there was a sudden outbreak.

Since that date, however, there had been two tranquil periods, one extending from September 22nd to December 8th of 1886, and another from January to April, 1887. In December, 1887, the spot area had been larger than in any month since May, 1886.

Mr. E. J. Stone read a paper on observations of the moon's place, made at the Radcliffe Observatory in 1887. In this paper Mr. Stone showed that the difference between the moon's observed and tabular place now amounted to fifteen seconds and eight-tenths. This difference is apparently due to a change in the length of our day.

Mr. Bryant suggested that the opposition of the small planet Sappho would afford an opportunity for determining the solar parallax, by comparing photographs of the planet and the neighbouring stars taken at different parts of the earth, or morning and evening photographs of the stars taken at an equatorial observatory. The Astronomer Royal read a paper on the spectroscopic observations of stars in the line of sight. From a series of measurements of the position of the F line in Sirius, he inferred that there was an orbital motion of the star around some dark body in its neighbourhood.

On March the 4th, Mars will be stationary at 2 hours after.

March 20th, the sun enters Aries, and Spring commences at 4 hours morn.

In this month there will be no occultation of interest.

In March Mercury is a morning star.

Venus is a morning star.

Mars is in Virgo and rises late in the evening.

Jupiter is nearly stationary in Scorpio near Antares.

Saturn may be seen near the meridian from 8 hours to 9 hours in the evening.

Meteorology.—At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 14th January, was 30·26 in. at the beginning of the week, and the highest 30·53 in. on Tuesday morning. The mean temperature of the air was 38·1 deg., and 0·1 deg. above the average. The general direction of the wind was south-west and east. Rain fell on Thursday to the amount of 0·02 of an inch. The duration of registered bright sunshine in the week was 0·0 hour, against 0·5 of an hour at Glynde Place, Lewes.

For the week ending 21st January, the highest reading of the barometer was 30·48 in., on Wednesday evening, and the lowest, 29·68 in., at the end of the week. The mean temperature of the air was 34·7 deg., and 4·1 deg. below the average. The general direction of the wind was easterly, until Thursday afternoon, after which it was south-westerly. Rain fell on Saturday, to the amount of 0·21 of an inch. The duration of registered bright sunshine in the week was 2·5 hours, against 12·3 hours at Glynde Place, Lewes.

For the week ending 28th January, the highest reading of the barometer was 30·28 in. at noon on Tuesday, and the lowest 29·66 in. on Thursday morning. The mean temperature of the air was 40·7 deg., and 0·9 deg. above the average. The general direction of the wind was north-westerly. Rain fell on two days of the week, to the aggregate amount of 0·10 of an inch. The duration of registered bright sunshine in the week was 3·0 hours, against 17·6 hours at Glynde Place, Lewes.

For the week ending 4th February, the lowest reading of the barometer was 29·08 in. on Tuesday afternoon, and the highest 30·15 in. at the end of the week. The mean temperature of the air was 33·7 deg., and 6·8 deg. below the average. The direction of the wind was variable. Rain or melted snow was measured on three days of the week, to the aggregate amount of 0·17 of an inch. The duration of registered bright sunshine in the week was 11·1 hours, against 12·6 hours at Glynde Place, Lewes.

For the week ending February 11th, the highest reading of the barometer was 30·15 in. at the beginning, and the lowest 29·26 in. at the end of the week. The mean temperature of the air was 43·6 deg., and 3·8 deg. above the average. The general direction of the wind was westerly. Rain fell on four days of the week, to the aggregate amount of 0·26 of an inch. The duration of registered bright sunshine in the week was 1·8 hours, against 5·5 hours at Glynde Place, Lewes. The continued deficiency of rain is becoming most serious.

In March the isotherms run across England in a North-Westerly direction. The mean average temperature for the month at Devonport and Plymouth is 45°. From Swansea to Dorchester it is 44°. On a line drawn through Birkenhead, Warwick, Oxford, London and Deal it is 43°, while at Lancaster, Burnley, Sheffield, Lincoln and Norwich it is 42°.

The average rainfall in March, for the greater part of the South Coast, varies between one and two inches. On the East Coast it is only one inch, while on the South-West and West coast it varies between two and three inches.

PAPERS ON DRAGON-FLIES.

The Metamorphoses of the Odonata.

By W. Harcourt Bath, *Author of "A Synopsis of the British Odonata," etc.*

Chapter I.—Introduction.

THERE is probably no group or section of insects whose true position has given entomologists more trouble to ascertain than the Odonata or dragon-flies.

Under the old Linnean system of classification, insects are arranged according to some structural resemblance which they bear to one another in common, thus the character of the wings represents the principal factor. This method, though it undoubtedly holds good in the majority of cases, fails entirely to assign a proper arrangement of that composite order known as the Neuroptera or nerve-winged insects.

Now the majority of the Neuroptera, it will be admitted by all, resemble one another, so far as the structure of their wings is concerned, but a criterion of far greater importance is presented in the fact that while two large sections of the order, namely, the Planipennia (or true Neuroptera) and the Trichoptera (or Caddis flies) possess complete or perfect metamorphoses, another large group, known as the *Pseudo-neuroptera* (which includes the dragon-flies, day-flies, stone-flies, and their allies), possesses incomplete or imperfect metamorphoses.

This vast distinction just pointed out applied to our present knowledge of the laws of evolution, ought to be sufficient to separate the two first-mentioned groups from the last one by a wide chasm, without any reference whatever to structural affinities or superficial resemblances.

In order, however, to expel (as it were) the Unionist party from its only stronghold, a very powerful structural separatist doctrine has comparatively recently been promulgated by several eminent entomologists (the Home Rule Party?) to the effect that the formation of the mouth * in the Pseudo-neuroptera, together with the very general presence of pointed styles or filaments at the extremity of the abdomen,* bears a remarkable analogical resemblance to the Orthoptera.

This, considered in conjunction with the much more important fact, that the metamorphoses of the Pseudo-neuroptera are similar to those of the Orthoptera, effectually precludes the practicability of the former ever again forming a natural alliance with the Neuroptera.

These considerations have even induced some modern writers † to unite the Pseudo-neuroptera with the Orthoptera—promoting the former group to the rank of a sub-order. Still more recently other writers have again reverted to the former system, but they offer no substantial reasons for the lines which they have adopted.‡ Thus the Pseudo-neuroptera have been enacting the typical bat in the amusing fable of the battle between the beasts and the birds.

With the whole facts of the case now displayed before us, it is not difficult for any one to determine the true position of the Pseudo-neuroptera. They may, without any hesitation, be proclaimed to be connecting links between the Neuroptera and the Orthoptera, for while they cannot be attached to either group, by reason that they partake to a certain extent of the structural characters of both, their metamorphoses, which resemble those of the Orthoptera, point to their being more closely connected with the latter order.

But, except in so far as is consistent with the object in view, it is not my intention to give an exposition of the biological position of the Odonata. I have written this and the succeeding papers to give a brief but clear outline of their metamorphoses, in order to act as a stimulus for further observation and investigation on their behalf, for hitherto comparatively very little has been recorded in connection with dragon-flies.

It will perhaps be necessary for me, in the first instance, to give some of the most important structural characteristics by which the insects under our consideration may be readily distinguished from allied groups of the Pseudo-neuroptera.

The imago possesses a large head, which is armed with a powerful and complicated mouth. It has a pair of very large compound eyes (which are contiguous in some groups and remote in others), consisting of a great number of lenses or facets. And in addition there are three simple eyes, called Ocelli or stemmata, which are situated on the crown of the head, and arranged either in a straight line or in the shape of a triangle. The antennæ are awl-shaped.

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* See Brullé, M. Aug, "On the Mouth of Libellulidæ," in 'Annales de la Société Entomologique de France." Paris, 1854.

* See Westwood, J. O., "An Introduction to the Modern Classification of Insects," 2 vols., 8vo. London, 1840. Libellulidæ, vol. ii. pp. 34–40.

† See Dallas, W. S., "Cassell's Natural History," 6 vols., 8vo. London, 1882. Odonata, vol. vi. pp. 143–146.

‡ See Kirby, W. F., "Elementary Text Book of Entomology." 8vo. London, 1885. Odonata, pp. 88–91.

The thorax is generally stout, and the abdomen comparatively long, being extremely slender in certain families. At the apex of the latter are situated two pairs of forcipated, or leaf-shaped appendages, varying considerably in form in the different species and also to a less degree in the sexes.

The wings are elegantly veined or reticulated, and both fore and hind pairs are equal in size. In repose they either rest horizontal or erect, the posterior pair never being folded.*

The metamorphoses of the Odonata, as has been previously mentioned, are incomplete or imperfect; that is, the larva differs very slightly in structure from the imago or perfect insect, and the pupa is lively with the exception of a very brief period previous to undergoing the final stage.

Dragon-flies are amphibious creatures, in all the earlier stages of their existence they reside in the water of streams, ponds, and lakes. No species has hitherto been discovered to inhabit salt water, though certain kinds have been found in brackish water,† a very important fact indeed, since it may prove eventually to be a valuable clue towards a solution of the origin of the Odonata and likewise to the elucidation of their evolution. One of the most wonderful facts in connection with the economy of these highly specialised insects is their mode of breathing in the water, which is not (in the Libellulina) by means of branchiæ as is the case with many other aquatic insects, but is internal—but we will reserve the discussion of this for another chapter. In the next, we will commence to consider the metamorphoses of the Odonata in detail.

(*To be continued.*)

SCIENCE-GOSSIP.

"MY TELESCOPE" is the title of a little astronomical work by "A Quekett Club-Man," whose kindred volumes on the microscope have been so successful. It will be published in a few days by Messrs. Roper & Drowley.

SILK-WORM COCOONS.—It would be interesting to know whether the brown silk, exhibited by Mr. E. B. Poulton and recorded on page 21, is liable to become the usual bright yellow on exposure to light for a long period.—*F. C. D. B.*

DEATH has been very busy lately in the ranks of the foremost scientific men of all countries. Many names will henceforth be removed from the lists of living, to those of historic, celebrities. Among them are the following:—Prof. Hayden, late director of the U. S. Geological Survey, at the comparatively early age of fifty-eight; Dr. Asa Gray, the distinguished American botanist, at the riper age of seventy-seven; Mr. Waterhouse, late keeper of the Geological Department of the British Museum, in his seventy-eighth year; Professor De Bary, the celebrated botanist and fungologist, at the age of fifty-seven; and others of less note.

DR. G. J. ROMANES has been elected to the Chair of Fullerian Professor at the Royal Institution, and intends occupying the whole of his three years of office delivering lectures on "Before and After Darwin."

MR. J. E. HARTING has been appointed Assistant Secretary to the Linnean Society in place of Dr. Murie.

THERE is nothing new under the sun! The other day there was dug up among other long-buried curios at Pompeii, a case containing a complete set of surgical instruments, many of which are said to be closely similar to those used at the present day. The medical art is evidently both very ancient and very conservative.

IT was the last French war which originated the beet-sugar manufacture in France. The sugar-loving Frenchmen could not get it from the West Indies. Within a very short period a sugar beet was artificially selected, and in our time this beet has so developed its saccharine qualities that it produces nearly twice as much sugar as it did in Napoleon's time. But the Germans also took up beet-sugar manufacture, and they have beaten the French even on this field of war. Thanks to their improved methods of extracting the sugar and molasses from the beet-root, they can now obtain nearly 11½lb. from 100-lb. weight of beet, so that the cost of the sugar is now reduced to 1d. per lb.

A WELL-KNOWN New York physician has just published the sort of discovery which Lord Lytton would have made a novel out of. An aged Polish count, formerly professor of languages and a famous Oriental scholar, died in the hospital, and Dr. Rookwood had occasion, in conjunction with other experts, to make a microscopical examination of a certain part of the cerebrum. They noticed a peculiar set of markings, which took the form of Egyptian and Chinese hieroglyphics. These were amplified to a magnitude of 3000 diameters, and the results shown to another Oriental scholar, who declared them to be true characters in the Ethiopic, Syriac, and Egyptian languages. Dr. Rookwood suggests that his discovery will lead to extracting from the dead their literary achievements as well as their "suppressed opinions."

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* For further and more complete particulars of structural characteristics, see Westwood, J. O., "An Introduction to the Modern Classification of Insects," 2 vols., 8vo. London, 1840. Libellulidæ, vol. ii. pp. 34–40.

† See Kingsley, John Sterling, "The Standard Natural History," 4 8vo. Boston, 1884. Odonata, vol. ii. p. 147 (Uhlers quoted).

The International Geological Congress of all the nations employing geological surveys is fixed to meet in London on September 17th of the present year, under the presidency of Professor Huxley. This congress assembles in a different country every three years. This will be the first time it has met in England.

A novel and important invention for the manufacture of copper-tubing has just been made by Mr. W. Elmore. He slowly deposits the copper by electrolytic action in a bath upon an iron mandril, which is kept rotating there. The copper is deposited in thin films, and as it is thrown down it is compressed by an agate burnisher into a hard and solid mass, of such great tensile strength that it has sustained a breaking strain of forty tons to the square inch.

An American inventor, Mr. A. P. Wade, has brought out a combined potato-digging and harvesting machine, which not only ploughs the potatoes out of the ground, but also separates them from soil and dirt, and either transfers them to a waggon or arranges them in rows, as may be desired.

Hitherto it has been laid down by physicists that the dull red rays of light are the first luminous rays to appear, but Mr. Weber has just shown that the filaments of solid carbon, gold, iron, and platinum give a grey glow first, and at a temperature below that of "red heat."

Some very suggestive and important experiments to chemists have been made by Professor Meyer, of Göttingen, on the ultimate atoms of carbon. He thinks that the atoms of carbon are spheres, each surrounded by an "ether shell," which latter forms the seat of its well-known four-coupling (quadrivalency) power. He imagines the "four-coupling" powers have some electric centres of connection, which he calls "electrules."

Our knowledge of the sun is increasing, thanks to the new spectroscopes. The latest bit of scientific information thus afforded is that platinum is a solar element.

Mr. W. E. Case has recently read a paper before the American Institute of Electric Engineers which is causing much attention. It is on the possibility of obtaining energy from carbon by electrical means without heat.

Botanical Evercirculator about to be started. Members wanted. No charge. Address J. Hamson, editor, 19 Victoria Road, Bedford.

The members of the Woolhope Naturalists' Club have contributed to the materials collected and arranged by the late Dr. Bull, of Hereford, on the birds of that district. The "Birds of Herefordshire" is therefore announced, price 5*s*.

The Natural History Society of Glasgow appears to have recently taken out a new lease of vigorous life, judging by the quality and character of the papers read.

A Canadian naturalist says that the bee's sting is by no means used for stinging only, but is utilised in doing all manner of artistic work, in capping the comb, and infusing formic acid, by means of which honey receives its keeping properties. The sting is in reality an exquisitely finished tiny trowel, with which the bee rounds and caps the cells when they are brimful of honey. This explains why honey extracted before it is capped over does not keep well; the formic acid has not been injected into it.

We are sorry to have to record the death of the well-known botanist, Dr. J. T. I. Boswell (an old and valued contributor to Science-Gossip). He is best known to many people as the editor of "Sowerby's Botany," to which he devoted twenty years of his life.

The annual meeting of the Geological Society awarded medals as follows, for distinguished services in this special science: H. B. Medlicott, the "Wollaston"; Professor Newberry (New York), the "Murchison," and Professor H. Alleyn Nicholson (the well-known author) the "Lyell."

During December and January Dr. J. E. Taylor delivered popular science lectures on geological, zoological, botanical and other subjects, to large audiences in various parts of the country, at Leighton Buzzard, Ipswich Museum, Wolverhampton Literary and Scientific Society, Hadleigh, Southwold, Windsor, Lowestoft, Manningtree, Chelmsford Museum, etc.

MICROSCOPY.

Notholca scapha.—I may perhaps be allowed to mention that I found these species in some abundance in this neighbourhood in October last. For some time after I met with it I did not know that it had ever been found in fresh water; and this fact, together with the long oval shape described by Mr. Lord, led me to doubt whether I had not had the good fortune to light upon a new species. After a time, however, I found that a dead specimen closely resembled Mr. Gosse's second figure of *N. scapha* in "The Rotifera." Till then I had thought my specimens might belong to a species intermediate between *N. scapha* and *N. thalassia* (not *thallasia*, as misprinted in Mr. Lord's article). I sent some of the water in which the Notholca occurred to Mr. Gosse. In the first bottle sent he did not find any specimens of Notholca, though he did find an undescribed Furcularia, which was very numerous; but in the

second bottle he found "a vigorous specimen," of which he told me that he had had "capital protracted observation." He then mentioned to me that Mr. Lord had sent him specimens last May which were indistinguishable from *N. scapha*; and he considered my species also to be the same. The general aspect of my specimens certainly agreed better with Mr. Lord's figures than with Mr. Gosse's; but I do not understand Mr. Lord's suggestion, that *N. scapha* might have been named from a dead specimen; surely it is clear that Mr. Gosse's first figure was drawn from life. I did not find that the broad outline was constant in dead specimens, and on the other hand I did find that the breadth of living examples varied considerably. The length, both absolute and relative, of the occipital spines also varies. I saw one specimen in which they were all unequal; that is to say, they were not arranged in pairs, but each spine differed perceptibly in length from all the others. Most of my specimens came from a puddle at the foot of a coal heap, near a disused colliery. This puddle contained a number of lobster-pots, sardine-boxes, and old boots, and other refuse of the same kind. A quantity of floccose vegetation floated on the top; and in the little heaps formed by this weed the Notholca found its food, which consisted chiefly, I think, of small diatoms. The action of the jaws in a healthy specimen is remarkably energetic. My experience unfortunately agrees with Mr. Lord's as to the short life of the species in captivity. It is curious that on the nineteenth of September last I found what I believe to be the same species in a shallow and rather muddy stream near here. I then found only two specimens, and have not been able to find any there since. My only reason for doubting the identity of this species is that I sometimes thought I saw a short, slender spine projecting from one side. But this spine, if it existed, was very much shorter than in Mr. Hood's figure of *N. spinifera*; and I never saw more than one spine at a time. The animals were too restless for satisfactory examination.—*J. W. Blagg, Greenhill, Cheadle, Staffordshire.*

MOUNTING PERISHABLE CRYSTALS SECTIONS.—A mounting medium should be transparent and colourless, if possible, of an index of refraction having reference to the subject treated, and free from moisture. It must not be a solvent of the matters that it is employed to preserve. As media of this kind especially worthy of attention for mounting perishable crystals, or such as lose their polish or become opaque in Canada balsam, as well as in the air, Professor Johnstone of Johns Hopkins University, recommends the following:—(1) Finest gum copal dissolved in chemically pure absolute alcohol; (2) Finest copal dissolved in chemically pure absolute alcohol; (3) Dammar resin dissolved in rectified spirits of turpentine. No heat should be used in making these solutions, and the resultant liquid should be very thick; (4) Dammar resin dissolved in well-boiled balsam copaiba; (5) Boiled Chian turpentine dissolved in boiled balsam copaiba; (6) Dammar resin boiled until the rising scum becomes nearly dissipated, the remaining scum to be removed with a spoon.

SECTION-CUTTING.—The application of the terms "hard" and "soft" paraffin, as employed by W. B. H., is likely to be a little misleading, especially as the majority of microtomists are familiar with medical literature. The term "soft paraffin," or Paraffinum molle, is technically and officially applied in the "British Pharmacopœia," and consequently in all works of Materia Medica, to a paraffin of a far lower melting-point than that so designated by your correspondent. It is the body popularly known as Vaseline. A paraffin imbedding wax of any desired melting-point below that of hard paraffin could readily be prepared, by melting together varying proportions of the official "Paraffinum durum" and "Paraffinum molle." These could readily be obtained from any pharmacist.—*J. Oldham Braithwaite.*

POND DREDGING AND COLLECTING.—In reply to your correspondent's query in the SCIENCE-GOSSIP for February [p. 45] as to the net to be used in collecting Rotifera, &c., I should advise him not to use a net at all. The best appliance with which I am acquainted is made by fastening a wide-mouthed glass bottle (such as a pomatum pot) to the end of a walking-stick, by means of a stout copper wire, which should be tightly whipped with strong thread and varnished. For more delicate work or for use in ponds, &c., comparatively free from weeds, a large sized test-tube might be substituted for the bottle and should be fastened to a short thin length of bamboo as follows:—Take a six-inch length of caoutchouc tubing, and make a cross cut three-quarters through, at about an inch from one end: then another at right angles to the first along the other five inches: the result is a short piece of tube with a five-inch slip of gutta-percha. The tube is slipped over the end of the rod, and the free end of the flap is pushed between the rod and the tubing, the test tube placed in the loop so formed and the slip drawn tight and fastened off.—*Jno. Eyre.*

ZOOLOGY.

THE LESSER WHITE-FRONTED GOOSE (*Anser erythropus*, Linn.).—A goose identified as one of this species, and apparently a wild one, was shot near this town in January last. This bird not having been admitted into the British list, the capture is an interesting one, and I shall be pleased to give further information on the subject to any one who will apply to me.—*W. Gyngell, Wellington, Somerset.*

Yellow (or Ray's Wagtail).—S. M. T. in Science-Gossip for January does not give the date when he observed Ray's wagtails on his lawn. If by "last month" he means November, it is possible they may have been grey wagtails (*Motacilla flava*) and not the yellow species (*M. raii*). The latter is a migratory bird, and generally leaves us in autumn, whilst the former remains with us all the winter. I generally see a pair of grey wagtails at Christmas in Somersetshire (about thirty miles from Weymouth), beside the little stream running through my brother's farmyard. They are usually to be seen in the yard, or at the drinking place for cattle in the adjoining field. In the winter plumage the breast and under-parts are a beautiful lemon-yellow merging into white at the throat. In the summer plumage the male has a conspicuous black throat, which it entirely loses in winter. On the other hand, I must say that the yellow wagtail is also a common bird in the same district. This last summer one of my friends saved me two nests which his men cut out of a vetch field, and in the autumn they are exceedingly numerous and tame, running about quite unconcernedly among the sheep whilst the shepherd is pitching out the fold. The yellow wagtail too has been observed by Dixon to remain with us occasionally all through the winter, and the fact of its being seen on a lawn is more in accordance with its habits than with those of the grey wagtail. There is a striking difference in the species in the length of tail, that of the latter being from three-quarters of an inch to an inch longer than the former. As the lawn would probably not be "newly mown" after the month of October, I think it most likely that the ten birds observed by S. M. T. were a party consisting of two broods from the same parents making their way down to the sea preparatory to migration.—*Robert H. Read.*

BOTANY.

Carex frigida, All.—Dr. Macfarlane has kindly sent me for examination, the original specimens gathered by Mr. Sadler in Glen Callater, and along with them a sheet from Wight's collection, with two specimens of undoubted *C. frigida* on it—from "Clova Mountains ex herb. W. H. Campbell"—doubtfully named *C. binervis*, Sm., but either Dr. Greville or Professor Graham has written "I doubt this." Both Mr. C. B. Clarke and Mr. N. E. Browne consider these specimens *C. frigida* of Allioni.—*A. Bennett.*

A Green Rose.—Last summer I came across a curious rose, a brief description of which may interest some of the many readers of your magazine. My attention was drawn to this flower, owing to its petals, as it then appeared, being unusually green, but it soon turned out that these seemingly green petals were the sepals of another and internal flower, which stood after its pedicel had fully developed, about one inch and a half above the lower flower. This lower flower seemed to be quite sterile, for its stamens bore no anthers, and they were unusually long and slender, and they very soon withered away, but the higher flower proved to be a good and healthy one, and seems to have made good the failures of its lower mate.—*G. Rees.*

GEOLOGY, &c.

A Relic of the Ages.—Discovery of Fossils.—An extraordinary discovery of fossils has just been made at Ilford. Some workmen who were at work extracting clay in the Cauliflower Brickfields came upon the bones of some large animal. When found, the bones of the head were almost perfect, and measured about seven feet round. The fossils were firmly imbedded in the clay, resting on a bed of sand, and from their appearance would lead one to suppose that the animal—presumably an elephant—had fallen head foremost to the earth and never again moved. The property has been used as a brickfield for about seven years, it having during that time been excavated to a great extent. Bones of animals have frequently been found, but a find of such an enormous relic of bygone ages is an unprecedented event.

A New British Fossil Carnivore.—A curious little object, a small fragment of jaw with three molar teeth, was the subject of much interest at the last meeting of the Geological Society. It was found in the Red Crag of Suffolk, and Professor Boyd Dawkins has christened it *Ailurus Anglicus.* The singular thing is that the family of raccoons is Indian, and previously the remains of a fossil Asiatic gazelle had been found in the same deposit, showing a former terrestrial connection with India. Did the raccoons get to India from England, or did they come from the former country to these latitudes?

NOTES AND QUERIES.

Yews.—Of ancient yews many authentic cases can be named. At Ankerwyke House, near Staines, there is, or was, a yew older than the Magna Carta itself, *i.e.* over 670 years old. This tree is stated to measure at three feet from the ground 9 ft. 3 in. in diameter, and its branches overshadow a circle of 207 ft. in circumference. At Fountains Abbey, in Yorkshire, there are some yews probably more than 1200 years old, and to others an age from 2500 to 3000 years has been assigned. The baobab tree of Africa is estimated by Adanson at 5000 years, and the deciduous cypresses of Chapultepec, in Mexico, are considered to be even older. But it must be borne in mind that, although in temperate climates trees shed their leaves and renew them once a year, and therefore one layer only is formed, whereas in

tropical climates, where many kinds of trees have two or three successions of leaves in a year, a corresponding number of layers will be formed. The method of ascertaining the age of an exogenous tree by counting the number of concentric rings visible would be absolutely correct, if one could be quite sure that observers provided against all possible causes of error. But it has been shown by Dr. Lindley that, in consequence of the extreme inequality in thickness of the annular layers of wood on the opposite sides of a stem, a person who judged of the whole age of a tree by the examination of the layers of the stunted side only would commit errors to the amount of 60 per cent. or more.—*F. C. D. B.*

CASTOR.—I think Mr. Ingersoll has made a slip of the pen (or else there has been a printer's error in the brackets), in calling the secretion of the male of the musk deer, "castor;" and there has been a further oversight in assigning to that animal a habitat in Africa. Castor is the secretion of the ano-preputial glands of the beaver (*Castor fiber*) of Europe, Asia, and America, the American being the least esteemed. If your contributor is referring to musk, that is the secretion of the preputial glands of the musk deer (*Moschus moschiferus*) of Central Asia. There is a musky secretion from the inguinal follicles of certain African antelopes, but this is not used as a drug. Antelopes of South Africa, Abyssinia, Nubia, Tripoli, Morocco and Senegal are known to emit this musky or sub-musky odour.—*Viator.*

CROAKING OF FROGS.—Having kept tree-frogs myself, I was much interested in the note by M. R. in the February issue of SCIENCE-GOSSIP. My frogs were kept in an old aquarium specially fitted up for their requirements; on no occasion, however, did I hear my pets croak, and they never entered water voluntarily. As they came from Germany, however, no doubt they partook somewhat of the phlegmatic seriousness of the proverbial German. I should much like to possess specimens of the species M. R. refers to, and would be exceedingly obliged if that gentleman would kindly inform me where, and from whom, they may be obtained. I always have understood that tree-frogs passed the winter in a torpid state, buried in the mud at the bottom of stagnant pools; and also, that they deposited their eggs therein previously to leaving the water. My frogs were quite as voracious as those possessed by M. R., and would take prodigious leaps after their prey and alight upon it with unerring accuracy. My pets, however, never attained to a greater size than an inch in length, two of them were green and two brown, and they never changed their colour, only appearing a little brighter after a cast of skin. I had an old frog once who used to croak dreadfully, he lived in a conservatory adjoining the house, and his croaking could be heard quite plainly in the house. He never croaked, however, unless he could find a pan of water to sit in, but so surely as water was left about on the floor he would get into it, and laying his throat quite flat on the surface of the water would give forth such a series of croakings and gurglings as made one's blood run cold.—*W. Finch, jun.*, 158 *Arkwright Street, Nottingham.*

ORNITHOLOGICAL VORACITY.—It is not at all unusual for birds to be suffocated whilst endeavouring to gorge food too large for them (SCIENCE-GOSSIP, p. 43). Quite recently I saw an account in a sporting paper of a heron which had choked itself in an endeavour to swallow a trout over 2 lbs. in weight. Mention was also made a short time since in the "Field" newspaper of a young pheasant being choked by swallowing a mouse. I once dissected a young heron, in whose stomach I found a very large water-rat, which occupied the whole of the bird's stomach, so that its long tail remained in the throat of the bird. How so young a bird had managed to swallow such an enormous bolus was truly a mystery.—*W. Finch, jun., Nottingham.*

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.

J. J. WOLFE.—Get Dr. Cooke's "Ponds and Ditches," published by S. P. C. K., price 2*s.* 6*d.*; also "A Thousand Objects for the Microscope" (with illustrations), by same author, price 1*s.* (Warne); also Rev. J. G. Wood's little book on "Microscopic Objects." Newman's "British Butterflies and Moths" contains capital figures of every species. You can now get a decent student's microscope for about £3 10*s.*

AMATOR NATURÆ.—A correspondent remarks that the insects described with this subscription are the females of the black ant.

R. C. C.—Dissolve a little of the best loaf sugar to saturation in a little hot distilled water. Place a little on a glass slide and gently heat the latter until the water is evaporated. The sugar-crystals will remain behind on the slide. Flowers are fertilised by minute insects getting inside when the myriads of minute male and female flowers are collected together.

A. ROSS.—The "Dutch Rush" to which Mr. M. Williams alluded is a species of *Equisetum*, perhaps *E. hyemale*, which goes by the name of the "Scouring Rush."

J. TAYLOR.—We are sorry that the limits of space make it impossible to admit your lists.

E. R. FAIRLEIGH.—Coloured plates are not now issued with the monthly parts of our Magazine. They ceased to be issued at the end of 1885.

EXCHANGES.

WANTED, pitchstone from Arran. Will give in exchange rocks or fossils or coal-plant sections.—James Spencer, 8 Salisbury Place, Halifax.

WANTED, fossil wood from all formations. Will give in exchange good transparent sections of coal-plants and spores.—James Spencer, 8 Salisbury Place, Halifax.

FOR exchange:—"Popular British Entomology," "Student's List of British Coleoptera," by Pascoe, new 1882; also "Dog Fiend" and "Privateersman" (Marryat); "Saucy Arethusa" (Chamier); "Sylvester Sound;" "The Count of Monte Cristo" (Alexandre Dumas); "Windsor Castle" (Ainsworth); "Young England" for 1886 (unbound), in good condition. Wanted, natural history objects of all kinds. Send lists.—E. O. Meyers, Richmond House, Hounslow, W.

"PRACTICAL HISTOLOGY," by Dr. Thiu (see "Hogg on the Micro," p. 224, 11th ed.), in exchange for slides of an interesting description.—Chas. Woods, 55½ King Street, Jersey.

ANATOMICAL slides (36), in exchange for others less scientific.—W. Woods, Red House, Wheatley, Oxon.

WHAT offers for Muspratt's "Chemistry as Applied and Relating to the Arts and Manufactures," parts 7–11, 14–21, 23–44, thirty-five parts in all?—A. E. Fasnacht, Clayton, Manchester.

FOR exchange, a perfectly new and unsoiled copy of J. G. Romane's work on "Jelly-fish, Star-fish, and Sea-urchins," for a copy of White's "Natural History of Selborne," or a few good fossils or foreign shells.—E. White, 3 Pixholm Grove, Dorking.

WANTED, Tyndall's Belfast Address to the British Association; also Darwin's "Variations of Animals and Plants," "Origin of Species." Cash or exchange (state desiderata).—Mark L. Sykes, New Lane, Winton, near Manchester.

WANTED, Dana's "Mineralogy" (edition 1887), also a book on the geology and mineralogy of the United States.—Thomas W. Reader, 171 Hemingford Road, London, N.

SCIENCE-GOSSIP, back numbers for 14 years, in exchange for books on Botany.—John Bracewell, 178 Jubilee Terrace, Accrington.

AMERICAN Lepidoptera pupæ in exchange—Cecropia, Attacus, &c., also five bred specimens of Cecropia. Wanted, English or other Lepidoptera, Coleoptera, &c.—Mark L. Sykes, New Lane, Winton, near Manchester.

WANTED, foraminiferous material in any quantity, British or foreign, fossil or recent, in exchange for named forams or marine specimens in any branch; state requirements.—Edward Halkyard, 2 Peel Villas, Cleveland Road, Jersey.

WHAT offers for Turner's "Elements of Chemistry," and Spencer and Kirby's "European Butterflies and Moths"?—A. W. Fry, 12 Winchester Street, Oreston, Brighton.

"BRITISH BEETLES," by E. C. Rye, with 16 coloured plates; also "Manual of British Coleoptera," by J. F. Stephens, F.L.S., pub. at 14*s*. 6*d*. Offers requested in foreign marine shells.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

WANTED, named and localised Diatomaceæ and Foraminifera. Will give good exchange in mounted Algæ, Polyzoa, and Hydrozoa.—Geo. Merritt, 282 Commercial Road, London, E.

DRAGON-FLIES wanted from all parts of the world for figuring; good exchange given.—W. Harcourt Bath, Birmingham.

WANTED, to correspond with all interested in the Isopoda (wood lice) and Myriapoda, with view to working up the two groups.—W. Harcourt Bath, Birmingham.

WANTED, Echinodermata and stalk-eyed Crustacea; natural history books and Lepidoptera given in exchange.—W. Harcourt West, Ladywood, Birmingham.

EXCHANGE wanted. SCIENCE-GOSSIP from Jan. 1883 to July 1883, also Oct. 1883.—Mrs. Bishop, The Platts, Watford.

MICRO slides (good selection) and carboniferous fossils, also some fine specimens of columnar coal, in exchange for rocks, minerals and crystals (almost any).—Robt. Pettigrew, jun., 66 Flowerhill Street, Airdrie, N.B.

WANTED, second-hand copy of Newman's "Butterflies and Moths."—R. B. Postans, 14 Enys Road, Eastbourne.

FOREIGN shells exchanged for others not in collection.—J. T. T. Reed, Ryhope, Sunderland.

WANTED, a good recent Manual of Geology (Lyell's "Student's" preferred), in exchange for Cassell's "European Ferns," 4to.; the thirty numbers complete, coloured plates, early impressions.—R. McCully, Albert Cottage, Winchester Road, Romsey, Hants.

OFFERED, SCIENCE-GOSSIP: 7 parts for 1879, 11 parts for 1880 (March part wanting), 1881–83 complete. Wanted, Horace B. Woodward's "Geology of England and Wales," 2nd ed.—I. Smith, Monkridden, Kilwinning.

Planorbis glaber for other land and freshwater, also foreign or marine shells.—John Clegg, 54 Canning Street, Burnley.

WANTED, good imbedding microtome, freezing microtome, micrographic Dictionary.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

PHOTO-MICROGRAPHIC lantern slides, section spine of *Echinometra heteropora*, cirrhi of barnacle, glass larva, *Leptodora hyalina* (male and female), chara in fructification, series of marine algæ with reproductive organs, new series whole and part insects, diatoms, &c. Will exchange for equal numbers first-class micro slides. Lists exchanged.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

WANTED, eggs of foreign birds in exchange for British.—W. Gyngell, Wellington, Somerset.

I SHOULD be glad to correspond with students of lichens, with a view to mutual assistance and interchange of specimens.—William Smith, Ormiston Lodge, Arbroath, N.B.

THE following micro-slides mounted by Watson & Sons:—Group diatoms, *Actinocyclus Ralfsii*; anchors and plates of Synapta (arranged); spicules of Gorgonia, Holothurea, &c. (very pretty); Polycistina from Cambridge Estate, Barbadoes, stained, opaque (very beautiful); a lovely slide of insects' scales, hairs, &c., arranged as flowers and butterfly, composed of 104 pieces (opaque); Polycistina, single *Astromma aristotelis*, perfect specimen (opaque); foraminifera from Adriatic Sea (transparent); selenite (blue and yellow).—Wanted in exchange, original Jubilee sixpences; those having any for disposal, please communicate with—M., c.o. Mrs. McMillan, 10 Queen Mary Avenue, Crosshill, Glasgow.

FOR exchange, three slides of spread diatoms, mounted by C. L. Peticolas, Richmond, Virginia, U.S.A., from the following localities:—Richmond, Virginia, Artesian Well, Cambridge, U.S.A., and Puget's Sound. The Artesian Well slide is said by the mounter to contain nearly 150 varieties, many very rare and beautiful forms. The other two slides also contain many splendid forms, and the three slides would form a rare addition to any collection of slides.—M., c.o. Mrs. McMillan, 10 Queen Mary Avenue, Crosshill, Glasgow.

WANTED, English or foreign shells, fossils, star-fish or sea urchins, in exchange for fossils, coins, medals, &c.—F. Stanley, Margate.

FOREIGN butterflies.—Many important species of Papilio, Morpho, Ornithoptera, &c., in duplicate. Parties having any duplicates (exotic only) should at once send lists. Also wings of *Morpho menelaus*, &c., for microscopic purposes.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

WANTED, "Wesley Naturalist" for March, 1887; will give in exchange micro materials or objects.—C. J. Watkins, Painswick, Gloucestershire.

WANTED, insect cabinet, six or eight drawers, with frames to glasses. Will give in exchange hand-painted lantern slides of micro objects, books on natural history, fine crystal and rock micro slides, or mounting materials.—C. J. Watkins, Painswick, Gloucestershire.

OFFERED, SCIENCE-GOSSIP for 1867, 1876–81, &c., and British plants. Wanted, SCIENCE-GOSSIP for 1870–75, and British fossils.—F. C. King, Bank Villa, Fulwood, Preston.

WANTED, Cooke's "Microscopic Fungi" (rust, smut, mildew and mould). Will give good value in micro slides.—J. C., 23 Roland Road, Lozells, Birmingham.

WANTED, diatoms and polar. slides; other slides given in exchange.—A. Downes, 5 Royal Park Road, Clifton, Bristol.

A LARGE quantity of whole insects in spirits, ready for mounting or sectionizing; will exchange for electrical, optical or any scientific apparatus.—W. White, 17 York Street, Nottingham.

WANTED, clutches of eggs with full data. Offered, other eggs and natural history specimens.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

DIATOM deposit from Nevada or Loch Kinnord, ¼ oz. for two good diatom slides or for other material.—E. A. Hutton, Motham, Manchester.

SHEEP fluke, sheep tick, and louse of calf, unmounted, in exchange for other objects of interest.—Rev. I. Stroud Williams, Livingstone Villa, Iffley Road, Oxford.

DUPLICATES of *P. glaber*, *P. dilatatus*, and many others, in exchange for Desiderata, Clausilia, Rolphii, or any of the Vertigos.—Sam Clough, 20 and 22 Abingdon Street, Blackpool.

WANTED, Cariniaria and other nucleobranchs; good exchange given. Also wanted, one species localized of the following genera:—Nerita, Oliva, Harpa, and Columbelladi, in exchange for several species of each unlocalized.—Wilfred Mark Webb, 31 Aynha Road, Brook Green, W.

IN return for half-a-dozen micro slides, I will send an assortment of animal hair, unmounted—about forty varieties.—Arthur H. Williams, Hythe.

WANTED, any of the vols. of the Paleontographical Society containing papers on "Eocene Mollusca," either complete or incomplete.—George E. East, jun., 10 Basinghall Street, E.C.

WANTED, Denny's "List and Nomenclature of British Anoplura," Pidget's "Anoplura," and other books on parasites; also mounted or unmounted parasites.—Fred. Lee Carter, Gosforth, Newcastle-on-Tyne.

WANTED, mahogany slide case to hold 48 or 72 microscopic slides; also double nose-piece, bent form. Will give in exchange unbound volumes of "Cassell's Saturday Journal," "Cassell's Family Magazine," "Leisure Hour," and "Young England," strong netted hammock, or micro slides.—T. H. Boorman, Tenterden.

MISCELLANEOUS microscopic slides, well mounted, in exchange for others. Send lists.—T. H. Boorman, Tenterden.

WANTED, one or two small healthy roots, *Vallisneria spiralis*, in exchange for micro slides. Will send list.—S. R. P., —8 Halkin Street West, S.W.

OFFERED:—*Pupa umbilicata*, *Vertigo edentula*, *Planorbis complanata*. Wanted:—*Pupa ringens*, *Clausilia Rolphii*, *Vertigo pusilla*, *Vertigo angustior*.—Miss Eyre, Swarraton Rectory, Alresford, Hants.

BOOKS, ETC., RECEIVED.

"Holiday Letters of a Geologist," by J. Shipman.—"The Story of Creation," by Edward C. Codd.—"The Microscope."—"Journal of Conchology."—"Book Chat."—"Scribner's Monthly."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News."—"Wesley Naturalist."—"Naturalists' Monthly."—"La Science Illustrée."—"Junior Review, Science, Lit. & Art."

COMMUNICATIONS RECEIVED UP TO THE 14TH ULT. FROM:
W. J. S.—A. J. S.—A. J. H. C.—J. S.—J. C.—I. M.—R. D. —G. A.—S. B.—W. E. S.—W. H. T.—J. C. P.—B. B. W.—A. B.—H. C. O.—F. D. B.—C. W.—B. T.—Miss W.—W. H. H.—E. H.—G. G. R.—T. H. G.—S. A. S.—A. H. W. F. S.—J. C. H.—U. S.—G. S.—I. S.—E. H.—A. W.—T. W. R.—J. B.—J. F. R.—D. A. M.—M. L. S.—J. S.—J. H.—A. E. F.—W. F., jun.—E. W.—T. W. K.—W. S.—J. O. B.—J. S.—W. M.—M.—W. S. D.—W. D. S.—A. R.—G. I. W. N.—W. G.—M. M.—R. Mc C.—F. M. C.—J. E.—J. T. T. R.—R. T. P.—R. P.—J. T.—J. D.—Mrs. B.—G. R. Rev. R. C. C.—W. J. J.—G. M.—H. A.—W. H. B—J. J. W. —F. F.—C. J. W.—A. H. W.—C. G.—C. F.—C. Y.—R. H. R. —J. H.—Rev. J. S. W.—F.—F. L. C.—W. M. W.—T. H. B. —S. S.—A. D.—J. C.—W. W.—C. B.—T. W.—S. C.—E. A. H. —G. E. E., jun.—C. S.—F. C. K.—C. R.—S. R. P.—E. R. F. —E. H. T.—W. L. W. E.—&c.

IN THE ISLE OF MAN.

By Dr. P. Q. KEEGAN.

BANG! went the gun from Fort Anne as we steamed gallantly into the imposing harbour of Douglas, the beautiful capital of the Isle of Man. Far out at sea, the island had presented a far-stretching array of ridges and knolls, towering not very picturesquely over the blue crystal of the ocean. Now, on our arrival, we knew prospectively that a region was to be visited not very eminent as regards scenic attractiveness, but one rather of pre-eminent scientific interest. Considering, therefore, in the first instance, that an adequate and satisfactory orographical review would be exceedingly serviceable, we forthwith walked to Laxey, and thence on the following day we climbed to the summit of Snaefell (2034 feet above the sea), the highest mountain in the island. The elements were sufficiently propitious, so that from this, the most central coigne of vantage in the British Islands, we were enabled to see portions of England, Wales, Scotland and Ireland, all in one vast visual circumference. The island itself beneath our feet looked however disproportionately small and humpy, something indeed which the radical natives are rather ashamed of. The old time-worn, force-shattered Silurian hills rose into sharp picturesque peaks or into gentle mounds terraced with earth and clothed with grass, while the innumerable brown-burnt dips and valleys between betokened a moorland bleakness of vegetation. So, too, from other points throughout the island, such as by the seaboard, many choice gems and bits of scenery were commanded. At Port Erin, Niarbyl Point, Langness promontory, etc., the ocean and the wave-shattered coast-line exhibited tints, hues, forms, and motions that were fresh and charming and worthy of a special niche in the memory. The Manx mind is eminently capable of discerning the weird power and fairy charm of nature, so that every nook and corner is associated with romantic legends and ghost tales. The general route pursued during the visit was from Douglas to Laxey, and over Snaefell to Ramsey, thence to Peel and St. Johns, whence we visited Castletown, Foxfield, Colby, and the adjacent coast, etc.

The physical conformation of the island is very remarkable. From its most northern extremity, viz. Point of Ayre, to about the distance of seven miles southwards, there is a perfectly flat, triangular tract, with only a few bosses or hills, the highest of which is 323 feet above the sea-level. Over this level, monotonous plain a lofty rampart of hills with bastions and buttresses abruptly impends, extending in an almost straight line from east to west. Thence succeeds a round, rather flat-topped, green-clad company of mountains which with their intersecting valleys and ravines cover the remainder of the island, except a few flattish tracts on the shore between Ballaugh and Peel, and a flat triangular patch in the extreme south in the immediate neighbourhood of Castleton. The seaboard is flanked by a vertical cliff-line, in some places only twenty feet high, but in others, as at Spanish Head, Clay Head, it slopes down for over three hundred feet in an almost sheer descent. Brada Head (766 feet) descends perpendicularly into the sea. There are many fine picturesque rocks, pinnacles, sea-caves and clefts, outlying stacks, natural arches, etc., along the coast. In some places marshy tracts occur, but at present there is not a single lake or tarn throughout the island. All round the seaboard there is evidence that the sea is leaving the land at a perceptible rate. It would seem that

immense lateral pressure emanates from the sea itself tending to fold, elevate, and crush the portion of the over-crust situated here.

Geology.

Our old familiar friend the metamorphic clay-slate of the Silurian system here greets us as of yore. The entire skeleton, so to speak, of the island and all the highest mountains thereof are composed of it. In fact, it may be regarded as the *sine qua non* of the territory, as doubtless a softer or a less matured or worse tempered rock would have been swept away long ago by the seas, or rather would not have endured the tremendous pressure from beneath and laterally to which it has evidently been subjected. It occurs in four forms, viz. as a sandstone or grit, a grey flagstone, a black slate, and a soft black shale. The Skiddaw slate of Cumberland is its nearest analogue; but the volcanic green slate and porphyry of that period have not here been observed in connection therewith. In places it is observed to be very slaty and splintery, indeed almost shaly. Here and there it is beautifully stratified, but sometimes it is twisted, contorted, bent nearly double, and its edges upturned (as at Little Ness and near Glen Cam), so as to be almost or quite vertical. These contortion phenomena are specially noticeable among rocks which jut into the sea, or at the base of marine precipices. Is it possible that the stupendous weight and impetus of the sea-water on either side of the strata may have exerted a mighty sideward pressure thereon sufficient to upraise and bend them? It is a singular fact in geology that all the existing volcanoes on the earth are near the sea or very large sheets of water, and as earthquakes are intimately connected with volcanic eruptions, it would appear that the motions of the water are more concerned with the folding and wrinkling of the earth's crust, etc., than what is generally supposed. However that may be, we must now remark that in the island we are now reviewing, the old red sandstone appears next after the Silurian slate resting unconformably thereon. It has evidently been greatly denuded, as it now appears in only a few places, such as for a mile and a half along the shore to the north of Peel, and near Ballasalla and Derby Haven in the south. On the peninsula of Langness it is seen as a conglomerate (supposed by Ward to be identical with the basement conglomerate of the carboniferous formation), and presents a beautiful and picturesque appearance, being composed of quartzite pebbles and boulders imbedded in a limestone matrix resting on the upturned edges of the slates, and chiselled by the waves into numerous grottoes, arches, pillars, pinnacles, etc. Next in order, and resting with complete conformity on the old red or conglomerate (as is well seen at Langness) come the well-known pinky-white, well-stratified slabs and spreads of the carboniferous limestone. It surrounds the bays in the neighbourhood of Castletown; and occurs also at Port St. Mary, Ballasalla, etc. To the north of the Peel there are the remains of a bed, and boulders of it are frequently washed up all along the north-west coast; so that it would appear that a sort of limestone reef occurs under the sea in that quarter. Its texture is for the most part finely granular, being fossiliferous only in a few places. At Poolvash, doubtless owing to the influence of the adjacent igneous rocks, it is developed into a fine, black, softish marble suitable for chimney-pieces, etc. After the limestone, there is a great gap or break in the succession of the Manx geological strata. The great formations of the Permian, Triassic, Jurassic, Cretaceous, Eocene, Miocene, and Pliocene are utterly unrepresented. Not a particle of coal, millstone grit, new red sandstone, lias clay, greensand, chalk, etc., has been found in the island. While, according to our ultra-speculative geologists, England, etc., has been alternately and periodically "ducking" up and down for so many thousands or millions of years in order to receive these deposits and their fossils, the Isle of Man has either remained stationary, or the stuff has all been swept off it. However that may be, it is certain that the Pleistocene formation is here extremely well developed, "better, perhaps," as has been said, "than in any other part of Great Britain." It covers all the lower tracts, *i.e.* to not more than five hundred feet above the sea-level, and is especially prominent in the great level plain on the north, and in the valley between Douglas and Peel. It consists of sand, gravel, shelly clay, rounded pebbles and boulders of almost every kind of rock, and forms as it were a sort of connecting link between the high dry land and the oozy depths of old ocean. Chalk flint, bluish clay (till), shell marl have also been found. Where these boulders came from, is a knotty problem. Geologists prate about ice and glaciers and the glacial period, and what not; but the idea of these outlying, heterogeneous masses of rocks being gradually pushed up from below by some lateral or other pressure, seems never to have tickled their heads. It may be observed, that in general there is a conspicuous absence of boulders on the Manx mountain sides, and there is little or no evidence of local glaciers, or indeed of ice-chiselling of any kind. The volcanic rocks of the island consist of "ash and breccia intersected by dykes of basalt," and form some very remarkable rugged and jagged pinnacles of low elevation on the southern shore.

Mineralogically considered, the island is extremely interesting. The granite is the most beautiful ever seen, being composed of flakes of glistening white silvery mica, and of white felspar imbedded in a pinky-white snowy quartz: frequently the felspar is left out of the bargain, and there is nothing but quartz and mica. Calcite and dolomite in very fine

crystals are plentiful, while graphite, witherite, barytes, hornblende, stilbite, and chlorite have been found in small quantities. There is a magnificent development of the metallic minerals, more especially of galena, which occurs in the largest crystals ever found at the Laxey and Foxdale mines. It is worked for at some twenty mines in the island, and is extremely rich in silver, containing in one spot as much as 1000 oz. thereof to the ton of lead ore: the average for the whole Manx mines being about 20 oz. to the ton of pure lead. Hæmatite is found in three mines; iron pyrites is common in rather good crystals; while limnite, titaniferrite, and vivianite are found in small quantities. Chrysocolla occurs in a massive incrusting state, and chalcopyrite (sometimes in very beautiful crystals) is yielded by four mines. Molybdenite, antimonite, and pyromorphite have been found sparingly. Blende is yielded by seven mines, and is here occasionally of a slaty-blue colour, and very beautifully crystallised. Umber and rottenstone have also been discovered in three different localities. On the whole, considering its size (viz. 33 miles long by 12 broad) the Isle of Man is extremely rich in mineralogical and metalliferous products. The earth's upper crust is here apparently thinner, and nearer the inner crust, as it were, than in most localities; hence the lavish effluence, and the superior beauty and purity of its constituent materials, proceeding from the very heart and core, so to speak, of the parental fountain of Nature herself. The granite, merging as it does into the quartz or quartzite, is here evidently an igneous rock, a fresh, unadulterated portion of the clear, fire-scathed contents of the very bowels of the earth. Through the cracks and cavities of the crushed, contorted slates the pure elemental metals, lead, zinc, etc., charged with sulphur, etc., have won their way, distilled from the adjacent beds, or more probably ejected in jets and streams pure and fresh from the subterranean reservoirs.

Botany.

But the crowning glory of the Isle of Man is its Botany. In what is designated the mid-agrarian zone, viz. that which extends from tide-level upwards to some 900 feet, its treasury is specially rich. From its splendid nurseries, its rich soil of pure sand and gravel, intermixed in many places with calcareous matter, springs forth a chaplet of pearls matchless and unparalleled among our natural flowers. The furze and broom, those brilliant tenants of the wastes and wilds, are here magnificently developed, clothing the hedges and lane-sides with festoons of yellow drapery. The marsh marigold, the mallows, the elder, heath and ling, the bog-bean, henbane, the mullein, the foxglove, the yellow iris flourish in rich and lavish luxuriance. The curraghs or sand-plains, the rocky bluffs and headlands, the rifts and gullies in the wild sea rocks nourish bouquets of plant organisms rarely found in the neighbouring coasts and islands. There may be found sea-kale (*Crambe maritima*), sea rocket (*Cakile maritima*), tamarisk (*Tamarix Anglica*), squill (*Scilla verna*), sea-holly (*Eryngium maritimum*), kidney vetch (*Anthyllis vulneraria*), dwarf furze (*Ulex nanus*), flax (*Linum angustifolium*), Isle of Man cabbage (*Brassica Monensis*), henbane (*Hyoscyamus niger*), cowbane (*Cicuta virosa*), saltwort (*Salsola Kali*), sand-spurry (*Spergularia neglecta* and *peploides*), etc.

At one spot in Poolvash Bay, near Castletown, where some limestone rock seamed with basalt underlies the lap of the sea meadow, its carpet was gloriously enamelled with bright-painted sea-pink interspersed with bladder-campion and bird's-foot trefoil, the whole forming a motley company disposed in waving ranks most beauteous to behold. That familiar tenant of the time-shattered ruin, the rare and interesting pellitory of the wall (*Parietaria officinalis*), spread its pink wreaths lavishly over the broken stones.

The common navelwort or wall pennywort (*Cotyledon umbilicus*) is extraordinarily abundant all over the island, studding with its stiff stems, thick leaves, and bell-shaped flowers, the old walls and ditches of every road and lane. On the other hand, there is no alpine flora upon the mountains, no dwarf willows, alpine sedges, sorrels, rues, saxifrages, hawkweeds, rock-cresses, chickweeds, etc., the highest summit, viz. Snaefell (2034 ft.), not being sufficiently elevated to furnish a garden suited for the culture of such exquisite organisms.

The following plants were personally observed in the island:—Pepperwort (*Lepidium Smithii*), bugle (*Ajuga reptans*), spearwort (*Ranunculus flammula*), marsh marigold (*Caltha palustris*), horned poppy (*Glaucium luteum*), scurvy grass (*Cochlearia officinalis*), milkwort (*Polygala vulgaris*), bladder campion (*Silene maritima*), sea mallow (*Lavatera arborea*), sandwort-spurry (*Spergularia neglecta*), cranesbill (*Geranium molle*), hop trefoil (*Trifolium procumbens*), kidney vetch (*Anthyllis vulneraria*), purple astragal (*Astragalus hypoglottis*), wood vetch (*Vicia sylvatica*), marsh cinquefoil (*Potentilla comarium*), wall pennywort (*Cotyledon umbilicus*), golden saxifrage (*Chrysosplenium oppositifolium*), sundew (*Drosera rotundifolia*), sea holly (*Eryngium maritimum*), bilberry (*Vaccinium myrtillus*), cross-leaved heath (*Erica tetralix*), sea milkwort (*Glaux maritima*), bogbean (*Menyanthes trifoliata*), small bugloss (*Lycopsis arvensis*), henbane (*Hyoscyamus niger*), foxglove (*Digitalis purpurea*), yellow and red rattle, ragged robin, ground ivy (*Nepeta glechoma*), red deadnettle, figwort (*Scrophularia nodosa*), wood-sage, pellitory of the wall (*Parietaria officinalis*), yellow iris, blue-bell, purple and butterfly orchis (*Habenaria bifolia*), sea pink (*Armeria maritima*), pondweed (*Potamogeton natans*), horse-tail (*Equisetum talmateja*).

A PAGE OF THE LIFE-HISTORY OF *STEPHANOCERAS EICHORNII.*

By W. H. Harris.

DURING the summer of 1887, I was fortunate enough to become possessed of some specimens of *Stephanoceras Eichornii.* Often had I searched for this king of animalcules in the numerous pools and dykes of this neighbourhood, and which had from time to time furnished specimens of rare forms; but never had I been able to take this creature. Now, however, I had a large colony close at hand. A tank which had stood in the slanting rays of light coming through a window having a south-easterly aspect was changed to another window facing the north-east; it had stood in the former position for two or three years; the results not being satisfactory, the change of quarters was decided upon and carried into effect in the early spring. In the following July a few specimens appeared, became more numerous during the ensuing three months, and continued in gradually diminishing numbers until the close of the year.

I had these creatures under observation for two months, and I propose to place upon record some of the phenomena which came under my notice, as an instalment towards the entire life-history of this exceedingly beautiful and interesting creature.

A word as to the method adopted for continuing the observations may be useful to others similarly employed. Simple means are frequently the best. The outfit consisted of a few thin flattish watch-glasses and a square of thin cover-glass. The specimen to be observed was removed into a watch-glass, with a small portion of the plant to which it was attached; a sufficient quantity of water given to cover the specimen. The cover-glass was then floated on the surface and observations made. When these were completed, the cover-glass was removed, a liberal supply of water given, and then placed aside under a wine-glass to exclude dust, and retard, as far as possible, the rapid evaporation caused by summer temperature.

Experience taught me that the secret of successfully preserving the specimens in good health, lay in removing the cover-glass; if this were not done, symptoms of declining health soon manifested themselves, the verticillate setæ lost their energy and contour; some dark spots collected in the main trunks of the arms; the whole organism languished, and if not relieved, death soon ensued. Specimens far advanced towards dissolution recovered under the changed conditions and fulfilled the object of their existence. Air, and plenty of it, was the key to success.

Until this conclusion was reached, my observations were liable to be interrupted at a very interesting point, and the labour expended lost to some extent. Soon, however, certain questions suggested themselves, answers to which could alone be given by the organisms. It was with the view of extracting these answers something like systematic obsevations were continued over the greater portion of the time mentioned.

How are the young produced? I had noticed that adult specimens when taken from the tank contained ova in different stages of development; that these decreased in number, but could not be found in the tube, as is the case with many other tube-dwelling rotifera; that after a short time a young specimen would be found in all respects, save one, like its parent, the difference consisted of size alone. Soon it was found they were ovoviviparous, the ovum being excluded and remaining in contact with the parent; the young one shortly after made its escape, and for a short time led a free life, roaming gracefully through the water until it settled down to the stern realities of its existence.

I was never fortunate enough to witness the actual exclusion of the ovum, although many hours were specially devoted to this end; that the act is a rapid one there is not the slightest doubt, as on several occasions the withdrawal of the eye for occasional relief was sufficient to thwart the object in view.

When the young first escape from the ova they are

Fig. 29.—Young Stephanoceros just emerged.

Fig. 30.—First formation of Tube.

mere sac-like creatures with a fringe of cilia around the anterior end, the posterior end contracts rapidly, terminating in a rounded point. The following example may be taken as fairly illustrative of the early stages of the organism and the time occupied, but as the season advanced and temperature fell the changes took longer time to effect.

August 29th, an ovum was excluded at 9.30 A.M., remaining attached to the lower part of the body of the parent, the young one emerged at 10.30, swam freely until 11 A.M.; it then settled down, and in a few seconds attached itself permanently; then elongated and contracted itself to its utmost extent, gave a few convulsive turns, and in three minutes from the time of settling the first portion of its future dwelling-place was distinctly visible. The idea conveyed to the mind by the series of movements I have attempted to describe was that it had thus divested itself of a very thin and hyaline pellicle, but whether this was really the fact remained undecided: the main bulk of the adult tube is considered to be a secretion, but this would not necessarily clash with the above idea; on the contrary, it can be readily conceived it would materially assist the flow of the fluids in a proper direction for the purpose it has to

serve. These movements accomplished, it retreated within the cup-like tube, assumed the form of a puff-ball, and remained quiescent for some time; changes, however, were proceeding, but so leisurely and slight they could be detected only by comparison from time to time. 3.10 P.M. the organism was visibly enlarged, the cilia had become arranged parallel to each other and protruded like a small brush, these were shortly afterwards absorbed, and at 4.30 P.M., the partly developed arms were plainly visible; progress contined to be made through the remainder of the day, but full development had not taken place when observations were suspended for the night. No food had apparently been taken up to this time, but the following morning the form was complete, feeding and progressing rapidly, the development to full size was shortly afterwards attained. These observations were confirmed on many subsequent occasions, the only difference being that of time occupied in the changes, sometimes one act would be prolonged and another executed rapidly.

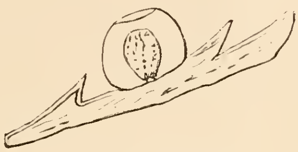

Fig. 31.—Resting period.

Fig. 32.—Appearance at 3.10 P.M.

How soon will reproduction take place? The following table will supply roughly the answer to this question. I was unable to reduce the time to hours, as on some occasions the young emerged during my absence.

One born August	23,	reproduced August	28 =	5 days.
,, ,,	25	,, ,,	30 =	5 ,,
,, ,,	25	,, ,,	31 =	6 ,,
,, ,,	28	,, September	1 =	4 ,,
,, ,,	28	,, ,,	6 =	9 ,,
,, ,,	29	,, ,,	7 =	9 ,,

An average of $6\frac{1}{3}$ days. In the case of the fourth example the full time between the limits was consumed, or in other words a very few more hours would have made this one five days also. Reproduction went on at the rate of one per day, only on one occasion was the second produced the same day, and here again a slight increase in time would have caused its record to be made the following day. The largest number produced by one individual was five, the smallest three, more frequently four completed the progeny.

Messrs. Hudson and Gosse, in their monograph on these organisms, say: "the male of Stephanocera has not been discovered." Without positively laying claim to have seen one, there was one individual might reasonably be considered a suspect. From its first emergence it was slightly larger than the generality of young forms, one of its sides was more deeply crenulated than usual, and small, dark, globular bodies could be detected therein. A pear-shaped cavity near the angle where the posterior portion rapidly narrows was partly filled with bodies of a similar nature, but these were in rapid motion—spermatozoa? This creature, like many others to be noted further on, was isolated from the first, it never settled down, but led a wandering life from first to last; its increase in size was very slight, and its development was arrested at a very early age. It lived for about thirty six-hours, and was never seen to take any food.

Fig. 33.—Development at 4.30 P.M

Fig. 34.—Suspected Male. (*a*) pear shaped cavity. Scale = 1000 inch.

How many generations are produced parthenogenetically? This question still requires an answer; until the male has been discovered, and observations start from the congress of sexes, it must wait solution. Young ones isolated immediately they emerged from the ovum, and supplied with water from a source when no other adult forms were present, were traced through four generations. The last members of this family contained ova, but from some cause they did not develop; and, notwithstanding the conditions were the same as had prevailed all through the course of observation, the creatures died without leaving issue. It was not that their life was cut short by any mishap; they lived as long as the generality of the tribe.

From thirteen to fourteen days appeared to be the allotted span of a healthy individual's existence;

they then appeared to die from sheer old age, a passive waiting for the dissolution; in other cases accidental injury from some cause or other, not known, heavily handicapped the individual and cut its life short. A peculiar form of disease was noted on several occasions. It commenced to exhibit itself at the extreme limits of the arms; a small contraction would be the first indication. This continued until a short length became detached, and by the movements of the creature would be driven away. These particles assumed a globular shape. In some instances a slight movement of the setæ was imagined; but whether this was really the case, witness would rather not say, but any one not knowing the source from whence these particles came would have pronounced them perfect organisms. This detachment of particles would continue until the five arms were reduced to mere stumps. Starvation terminated existence in such cases. One had lost an entire arm, but made a gallant fight with the remaining four, and succeeded in fulfilling the object of its existence.

Malformation or teratology is not unfrequent. The creature would then present a very woebegone appearance; instead of the graceful form and beautiful curves it would be shortened, thickened, angular: sluggish in its movements, and a general don't-care-about-anything style clearly portrayed. The term of life was much shortened under such conditions.

Their appetite appears insatiable, they seem ever on the alert for food. Animal organisms are preferred, but if these fail they will take vegetable. One was observed with the empty lorica of a small rotifer engulfed. This was too much for the digestive powers; it withstood disintegration, and Stephanoceras was the first to disappear. Another embraced a Stentor within its arms and retained it for some time, making decided attempts to appropriate it. Its efforts were futile, and the meal had to be abandoned.

Do they possess urticating power? From some observations made, I am disposed to think they can exercise this function. Having given a supply of water which was teeming with monads, the arms of Stephanoceras quickly enclosed a larger number than it could conveniently make use of. They would continue to dart about within the limits of the crown, until, by a sudden retraction of the foot-stalk and opening of the arms, the entire contents were ejected. On emergence, many of the monads lay motionless, some for ever; others recovered, and went on their way as usual. If my surmise is correct, as to their possessing this power, I am disposed to think the most potent effects were exercised towards the extremities of the arms. The organisms would be lively until they came in contact with the setæ located in these parts. Here the natural movement of the organism ceased, and they were finally ejected as described.

The subject was full of interest. The creatures became almost acquaintances, and their welfare was studied accordingly; death caused regret, but birth brought satisfaction. I can recommend their study to all—a capital exercise to develop patience. Will any follow on?

Cardiff.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

SYNTHESIS OF ORGANIC COMPOUNDS.—Within my recollection one of the positive dogmas of chemistry was that it is impossible by any laboratory process to make organic compounds from inorganic materials. That one organic compound could be made from another by substitution of elements, or by such actions as convert sugar into alcohol or vinegar was understood, just as we now understand the evolutions of new species from other species, but the creation of organic materials from mineral matter was regarded by chemists to be just as impossible as biologists still regard the creation of organised beings from anything but an organised germ.

Gradually, however, the chemical chasm has been narrowed and even bridged, and the supposed chemical impossibility approximately achieved. At first, the organic substances built up by inorganic synthesis were only those of questionable class, such as are formed in the later stages of organic degeneration, by the so-called organic substances in the course of their disintegration to form mineral matter, but this is no longer the case. Substances which according to the old definitions are strictly organic, and which according to old theories can only be built up by the intervention of "vital force," are now constructed from purely mineral materials or from those of lower rank in the scale of organic degradation.

One of the latest of these achievements is the synthesis of glucose or "grape sugar," the substance from which it is gradually built up by a series of additions and subtractions of elements being acrolein, a compound resulting from the partial combustion of one of the alcohols. Year by year the achievements in this direction become more and more pronounced, and no sound philosopher will now venture to define the limits of such progress. I should, however, explain to non-technical readers that, although the sugars are all organic compounds, *i.e.* compounds which only exist naturally as the results of organic action, they are not organised, they exhibit no traces of organic structure; their structure is crystalline, and in this respect they resemble minerals. We have not yet reached the synthesis of the materials of organic tissues, such as gelatin, chondrin, &c., but this glucose

approaches within one short step to cellulose, the material of the cell-walls, or the general basis of the organised structure of plants.

"The Gift of the Nile."—Sound geological philosophy is profoundly indebted to Sir Charles Lyell, who not only hammered at rocks, but, hammered, hammered, and hammered, most pertinaciously at the heads of his contemporaries to insert therein the fundamental geological principle, that "causes similar in kind and energy to those now acting, have produced the former changes of the earth's surface." "The Principles of Geology"—his main hammer—still remains, in my estimation, the most fascinating scientific treatise that has ever been written. The multitude of facts, all intensely interesting, and admirably arranged, is astonishingly great; the book is a monument of industry in their collection. It is written with such simplicity and clearness throughout that anybody may read and understand every paragraph without any previous technical training. If any of my readers have not yet read it, I exhort them to commence at once at Chapter I., and go steadily through to the end. Whether they have read all the newer geological treatises, or no geological treatise whatever, they will be far wiser after reading Lyell's book than they were before.

These remarks are suggested by a work which is now in hand, viz. the Royal Society's borings in the delta of the Nile, which have gone considerably beyond 300 feet in depth without reaching the rock which forms the bed of the marine valley which this river has filled up with a deposit of almost continental magnitude, and has done it all during the present geological epoch. Egypt is "the gift of the Nile," and in spite of its great magnitude all this deposit is, geologically speaking, but the work of to-day. It is demonstrable that the great river has flowed in its present course with similar geological results, undisturbed by any great upheavals or other catastrophes, ever since it fell Niagara-like over the rocks of a sea coast which are now more than one hundred miles inland.

Snow Clothing.—Seventy to eighty degrees below zero, *i.e.* thirty to forty degrees below the freezing-point of mercury, is a temperature we can scarcely contemplate without a shudder, yet such was endured in Siberia by Captain Wiggins and his crew last October.

It is in such a climate as this that the beneficence of snow is fully manifested. The snow falls heavily at the beginning of winter, while the surface of the ground has not yet fallen below thirty-two degrees, the snow itself being at about that temperature, or say thirty degrees. The feathery crystals and the air they entangle are nearly absolute non-conductors of heat, and constitute the most effective of all possible clothing. Thus the soil in such countries never falls to so low a minimum temperature as it occasionally reaches in England when we have a temperature of fifteen to twenty degrees over naked ground. Hence the paradox of Siberian vegetation, which is so luxuriant in the summer, when the heat of the long days is very intense.

Do Birds Sleep on the Wing?—This question has been seriously propounded in the New York National Academy of Sciences, where Professor W. P. Trowbridge read a paper describing his son's discovery, that birds of prey and some others have the power of locking securely together those parts of the wing which affect the extension of the feathers, and correspond to the fingers of the human hand. The wings are thus kept in the soaring extension and position without any muscular effort. At first thought, the idea that a bird should maintain its delicate balance even during a few minutes' doze appears extravagant, but the idea assumes a different aspect after a little reflection. It is well known that men have fallen asleep while walking, and have thus walked some distance. I know a case of a farmer who has fallen asleep on horseback without falling off when returning home after market dinner. We can all understand the possibility of sleeping while standing upright or even walking, and those who are accustomed to the saddle can understand the farmer's exploit, but, on the other hand, there are some among us who cannot keep the saddle even when very wide awake. A dog that has just learned to sit on its haunches and beg, would not be able to sleep in that position.

These possibilities simply depend upon whether the action in question, flying, walking, standing, or riding, has become automatic. Regarded theoretically the art of balancing the human body on so small a base as the human feet is one of marvellous muscular complexity, but practically it is so easy as to be performed without any conscious effort. Theoretically regarded by us the art of flying and soaring are extremely difficult, but practically they are doubtless as easy to the bird as walking and standing are to us, and therefore may be performed as automatically. Admitting this, it is still very improbable that the bird can do any more than "forty winks," a semi-conscious after-dinner snooze while in mid-air. Taking a night's rest, or even a fraction thereof, is very different.

Energetic Ballast.—Electric accumulators are subject to a serious objection. The plates in which the latent energy is stored are of lead, and a great surface of this being demanded they are very heavy: their use is restricted accordingly. But there is one case where a heavy weight is desirable, in fact necessary; this is in the ballasting of ships. With accumulator ballast and a little dynamo to charge it, a yacht or other vessel may be supplied with a reserve of energy available for lighting. It might even supply

mechanical power. In the paragraph where I found the suggestion it is truly added that "it would be a novelty to have the ballast weighing the anchor or hauling at the ropes." The probability of this however, is very remote, as the conversion of the mechanical power of the engine that drives the dynamo into electrical energy, and the reconversion of this back to mechanical power is a roundabout and costly proceeding The conversion of the engine power into light is very different in places where cheap gas is not obtainable. Paraffin lamps are objectionable on board ship, and the ordinary colza oil ship lamps are very costly in working, many times more so than gas in town. The electric light on board ship is a most desirable luxury, and compared with other available sources of light, is the most economical. It is rapidly coming into general use.

THE RINGS OF SATURN.—There remains now but little doubt concerning the nature of these marvels of the heavens which so long have puzzled astronomers. They cannot be the solid flat hoops that they appear to be, as they are too thin in proportion to their other dimensions to retain their stability against the gravitation of their primary. The idea that they are liquid comes to grief still more hopelessly.

But they may be, and in all probability are, a multitude of small satellites which, seen as we see them with their interspaces foreshortened, need not be very close together to appear continuous. To understand this, place yourself at night on Constitution Hill, Piccadilly, or on any other street where you command the view of a row of gas lights half a mile long in foreshortened perspective. It will then be seen that the distant gas lights appear to touch each other, to form a continuous line instead of a row of luminous dots, as do those which are nearer, or are viewed more athwart the line.

Further evidence in support of this view of the constitution of the rings is continually coming forward in observations of changes among the rings. Thus the observations of Paul Stroobant ("Bulletin de l'Académie Royale de Belgique," November, 1887), extending from January 27th to April 20th, show that the divisions known as Encke's and Struve's are subject to considerable changes of position, and to occasional disappearance of one, while the other remains visible. The changes of the inner dusky ring are still more remarkable, and indicate extreme mobility of its constituents; suggesting the idea that it bears a relation to Saturn similar to that of the zodiacal light to the sun.

C. EDUSA.—Can any of your correspondents tell me if this insect has been taken in this district during the past season? I have not heard of a single specimen being seen for several seasons.—*C. S., Penarth, near Cardiff.*

DRYING PLANTS ON A TOUR.

IN the November number of SCIENCE-GOSSIP there is a paper by M. Copineau, "On Drying of Plants on a Tour," in which he states that it is of the greatest importance that they be dried quickly, and never be allowed to remain in damp paper. Every one I believe, will agree with this statement, but few, I imagine, will admit that he has hit upon the best means to attain this most desirable end. My idea is that, for the speedy drying of papers, it is most essential that every sheet should be separated, and that no greater mistake can be made than by sewing eight or ten thicknesses of paper together, and so forming a pad. I do not either like the form of press he recommends, so will proceed to describe the methods I have adopted.

When I start on a fortnight's tour, I generally take a supply of drying paper about ten inches in depth, this I find amply sufficient for the first few days, and it allows of changing the plants into fresh paper every night; my last performance before getting into bed is to begin in one corner of the room and stand

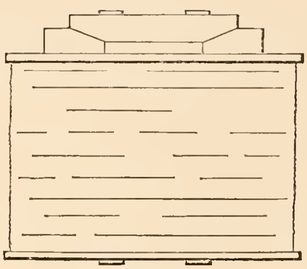

Fig. 35.

all the damp papers up on end, and by morning I find they are quite fit to use again. At first sight it may appear rather difficult to stand up limp paper in this manner, but there is really no difficulty about it, by maintaining the fold in the middle of the paper and curving back the edges so that the plan gives somewhat the outline of the figure 3, one is made to support another with the least amount of contact. Of course, I will at once admit, it adds nothing to the tidiness of one's bedroom, but after a long day's tramp, I have never found this interfere in any way with my slumbers, and I can guarantee its efficiency.

There is perhaps no better way of drying papers than laying them out singly in the sun, as by the time the last one is disposed of, the first is quite dry enough to be taken up again. I confess, however, when the sun is shining I want to be doing something else, and it is not always safe to delegate the work to others.

I have made modifications in my presses from time to time, and the one I use for travelling, to me seems a very efficient one, and has been copied by several of my friends. It consists of two boards

made of American walnut 18 inches by 12 inches, and ¾ inch thick, well seasoned and French polished, with two grooves sunk in each of the long sides, to take two of the strongest portmanteau straps procurable. Having arranged all the plants with as much paper as possible between each layer, I put on the top board and strap as tightly as I can. I next take a stretcher, a piece of wood 12 inches long, 1¼ thick, with both ends cut into a wedge. Inserting one end of this under one of the straps, I force the strap up, and then pull the other strap over the opposite end. It is now pretty tight, but not tight enough for me, and two wedges cut to the same angle are inserted underneath the stretcher, one at either end, and forcing these towards the centre the straps are further tightened, and the pressure considerably increased. It is absolutely essential that the straps should be of the best, and kept well oiled, or they will not stand this treatment long. This is the press I take on my holiday excursions, it just drops into a light deal box, which, when corded, is quite safe to hand over to the tender mercies of a railway porter.

For home use I have a more substantial affair; the

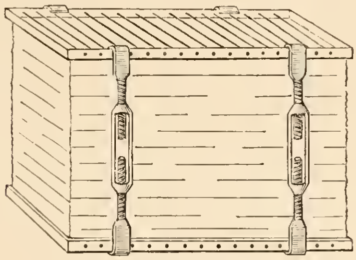

Fig. 36.

boards are made of birch two inches thick, but, instead of using straps, I have had two squares made of hoop iron twelve inches wide and eighteen inches high, with the ends lapped over and riveted. The upper part of each square is let into a shallow groove in a strip of ash to keep it in shape, and this being very springy, keeps up a good pressure when the stretcher and wedges are introduced. This plan is much cheaper than straps, being practically indestructible, and if it is thought desirable, the wedges may be driven home with a mallet.

I have, however, a third form to suggest which has several advantages, but involves a greater cost. It is composed entirely of metal. Two gratings are made on the principle of the gridiron, with the bars one inch apart. The papers containing the plants are placed between these gratings, and they are drawn together on each of the longer sides by two screw arrangements, similar to those used for tightening the stays of telegraph posts. By turning round the centre socket, which has a screw at each end, but the threads cut in opposite directions, the opposite edges are rapidly drawn together and maintained there with a considerable pressure.

There is thus a slight economy in space and there is nothing to wear out, but what particularly recommends this method is, that it can be put into the oven, before the fire, or other warm place, without running any risk. Straps will not stand this treatment for any long time, and I have known cord give way and do some damage to the surroundings. It must also be borne in mind that, if the papers are dried in the press in this manner, a vast amount of time is saved.

Those who are occupied more particularly with water plants such as charas, potamogetons, etc., would find great advantage in having a light tin or zinc trough about three inches in depth into which the press would just drop and which would fit easily inside the box in which the press travels. I have found this much more convenient than anything else for floating such plants on to the papers, and believe the results to be more satisfactory than any other.

Fig. 35 represents a section through the long diameter of the first press, and Fig. 36 a perspective view of the metal one.

FREDERIC H. WARD.

Springfield, Tooting.

A NATURALIST OUTWARD BOUND.

As an old contributor, I request that you will publish this letter should it reach London safely; for the novel experiences of one unaccustomed to the tropical wealth of Ceylon may entertain many of your readers. I write far away from land, rushing forward in a Peninsular and Oriental Mail towards the Australian coast. To-day we cross the Line; the temperature in the shade at mid-day is 82° Fahr., but the rush of air created by the pace of the ship apparently cools the atmosphere and renders heat pleasant. The pole star and familiar Great Bear have nearly, if not quite, disappeared from sight; the Southern Cross and constellation of the Ship are gradually rising earlier each night above the horizon. Two nights ago I watched the slow course of a large meteor; it fell from the zenith towards the north-east, leaving a distinct trail of light and illuminating the deck of our vessel as if with summer lightning—thousands of flying fish skim the waters; to watch their action is quite a fascination. By comparison with the speed of the ship I reckon they attain a flight of about twelve miles an hour, while seventy seconds is the longest period that I have noted one to remain out of water, during which it touched the waves more than once. In the Red Sea the medusæ floated near the surface of the water in considerable numbers. Some were of an exquisite violet tinge; others milky-white, with red organs within. At night thousands of solitary phosphorescent lights floated by, evolved, I think, from these jelly-fish. One Portuguese man-of-war I noticed sailing grace-

fully with long streamers attached. In the Red Sea and Indian Ocean birds seem few and far between. Near isolated rocks one beautiful species prevails. It has a rich chestnut back and wings; body elongated in flight; head brilliant white, breast white; underparts of wings white with dark rim. If any reader will identify this bird I shall esteem it a favour. By the side of the Suez Canal thousands of flamingoes stood in the marshy lake immovable, and so like reeds that one could hardly credit the assertion that they were birds; the illusion was perfect—suddenly, however, the spirit moved them to flight, and long lines of awkward birds fled away. Two Egyptian vultures rested on sandy hillocks. A pelican and a crane were chained to a floating house on the canal. Lots of wagtails flitted by the shore, three species, as figured by Dresser, I clearly identified with the aid of field-glasses, viz. *M. alba*, the white wagtail, *M. flava*, the blue-headed wagtail, and the grey wagtail, which is sulphur-yellow breasted (the specific name escapes my memory, it is not Ray's species). An anthus was associated with these, probably either Richards' or rock-pipit. We passed the wonderful Suez Canal in the short time of nineteen hours.

Passing the coral reefs of the distant Lacadive Islands the first glimpse of palms was visible standing up apparently on nothing. Colombo was reached after dark. Some passengers landed at once to pass the night in the hotel. I remained on board ship, but as coaling operations were in progress, and consequently port-holes closed, the heat and noise were great; it was in fact very oppressive. Ashore they suffered greatly from heat and mosquitoes.

It was daylight at six o'clock, and the ship was timed to leave at 2 P.M. Our passage from London had been a record, viz. twenty days; to Australia not an instant will be wasted, therefore our time allowance on shore is not over-liberal. These following observations on tropical Ceylon must of necessity be fragmentary and incomplete.

In the early morn the scene in the harbour was animated. Scores of native boys crowded round us in most primitive boats—simply bits of hollow trunk fastened together and propelled by short sections of bamboo. These lads shout and jabber in excited style, clamouring for coins to be thrown into the water, after which they dive with admirable skill and graceful action. Their skin is a rich copper-colour, the hair absolute black. I think they must anoint a good deal with cocoanut-oil, so greatly do their bodies and hair shine; sharks are said to abound in the waters, but there is no indication of fear. The native catamarans are boats of singular construction about eleven inches in width, but very long. On one side two bamboos stretch over the surface of the water, with a heavy log attached at the far ends. By this contrivance the risk of capsizing is reduced to nothing; they carry sail and brave the open sea in rough weather. Glancing from the shipping to the land, I was at once struck with the enormous numbers of cocoanut-palms with straight, bare trunks and gracefully bent terminal foliage and clusters of green, or yellow fruit; for there were two kinds, one known as the traveller's-tree having yellow fruit, and which contains the most refreshing fluid. The coast line here is low and flat, the mountains of the interior were hidden in the early mists. First thing on landing I engaged a rogue of a guide named Peter to show us rapidly about, and keep other rogues and beggars away. The first question he asked me was if the three ladies of the party were all my wives? He received the negative with some incredulity, I believe.

As the heat was about 85° Fahr., I hired a covered yet open carriage, at six rupees for the day, to drive through the palm plantations and cinnamon groves of the vicinity, to a finely situated hotel at Mount Lavinia, for early breakfast. Here, by the sea shore, we had most fragrant and perfect tea, with good fried fish, a species of grey mullet caught half an hour before among the rocks. Large prawns also appeared abundant. Fresh-gathered green oranges and delicately flavoured bananas were placed on the table, and we enjoyed the novelty of our surroundings. Little black fellows hovered round us at every step out of doors. "Me hungry" (smacking his stomach lustily); "Me no fader—he die yesterday" (with broad grin); "Give money, master," and such remarks greeted us. Telling one he ought to be at school, he at once recited the English alphabet with conscious pride. Some were handsome, all were interesting, but got wearisome, and pestered sadly.

What can I say of the vegetation after such a rapid glimpse? It would be almost better to remain silent; yet I cannot resist writing these lines. The spreading, ample foliage of the bananas and plantains, most beautiful among green tints, flourished on all sides, in forcible contrast to the lofty palms and the rich chocolate soil. The variety of banana here most esteemed has small, yellow-coated fruit, with somewhat of the pine flavour. It is most agreeable to the taste, and melts away in the mouth.

It is most nutritious among articles of food, and is capable of supporting a greater population than anything known in the world. The tree bearing the bread-fruit (is this the same as jack-fruit?), was plentiful, the oval, rough-skinned fruit being attached to the trunk in irregular manner. Mangoes were here and there, but not in full perfection at this season; the smooth, green fruit I did see on one tree. Opuntia, or prickly pear, grew as a weed, but they looked small, and had no fruit. Long and narrow cacti, with angular growth, stood some fifteen feet high. The hibiscus was in all its glory. The single-flowered scarlet species formed regular hedges—a veritable blaze of colour. It is called, I think, the "shoe-plant," because a sort of black fluid is obtained, used either for blacking boots or for ink.

The double variety was scarlet rose, or cream colour; but I usually regard single flowers as the most beautiful, and certainly it is so in this instance.

Hard by this splendid hedge of single scarlet hibiscus grew an English monthly rose; we greeted it with friendly gaze and real pleasure. Ancient-looking banian-trees, with characteristic hanging roots, are treasured almost as a sacred tree by the Buddhist Cingalese. There is also a fine sacred flower tree, gathered for offerings in the temples, which has thick-petalled, white flowers with yellow centres. But I think the finest of all was the lotus-tree, with abundant silvery green foliage and large yellow flowers, red in bud, and only expanding in full sunlight. A scarlet acacia was also very attractive, and allied genera had yellow, white and mauve blossoms. They were leguminous plants, but beyond that I am floundering in hopeless ignorance.

A rose-coloured creeper of the same order was among the most brilliant flowers. A minute trefoil with single lilac petals grew in the sand, with a large pea-like lathyrus, and two other yellow leguminous weeds. A large shrub with single rose-coloured corollas looked exactly like a phlox. A crimson trumpet-shaped, elongated flower must be of the Loniceraceæ. A spiked blue veronica grew in places like twitch. The varied brilliance of the crotons, and a kind of coleus, cannot be described; they enliven every cottage plot in the native villages. Creeping ferns lined the watercourses, and we gathered seedlings of several other species.

On many bungalows the bougainvillea attained great luxuriance. I believe the fine colour belongs to strongly developed bracts rather than to the true flower. This applies also to the Poinsettias, standing with scarlet involucra many feet high in gardens, but said to be introduced into Ceylon. I saw a single sandal-wood tree in a garden. I should imagine it is indigenous in the interior of the country. The castor-oil plant of course abounded; and we noted a caper. The betel-nut is hawked about in a fresh state, for staining the teeth, etc., so it doubtless grows at hand. Pines are common enough, selling even to strangers at fourpence apiece; but they lack flavour, and are woody in texture. I had never seen one green.

Two species of bamboo stood side by side. The native kind has yellow stems, the introduced one being all green. On the sandy shore a bright convolvulus-like flower spread in a manner suggestive of our own bindweeds; the ample corolla was rose to puce colour, and the fleshy leaves were in pairs. A most picturesque sheet of water, surrounded by palms, had the surface covered with curious floating leaves, barred with dark lines, evidently of the water-lily order; but not a single flower was expanded. By the edge of the water great aloes and other plants flourished. Another weed I gathered was a pretty composite flower with violet rays, perhaps nearly akin to the European prenanthes. A shrub with crimson blossoms had a calyx-like expansion, such as the medlar, but smaller and more elongated. Near this spot an imp of a boy exhibited a captive butterfly. It was attached to a long string, and allowed short flights every now and then for me to examine. It was about the size of a Camberwell beauty, of a dull brown-black, with lighter rims to each wing, and slightly metallic in the sunlight. It was plentifully distributed in the vicinity, and easily caught with the hand as it settled on bright flowers. Two other butterflies we saw—a small sulphur-coloured species, flitting about in pairs, and a very large fellow, flying like a humming-bird, with the prevailing colours and shape of a swallow tail; but this restless creature would not alight for close examination. He was attracted to the creeping ferns by the side of the stream.

Among the birds I saw three or four small, entirely red, crested, vivacious little creatures, flying together from tree to tree, and a black and white bird, which might be a shrike. Green parakeets, with red caps, frequent the forests, but we had no time to investigate a tithe of what was at hand. The domestic oxen drawing the native carts are a small, patient-looking race of buffalo, chiefly black or dun colour. Another species, shaggy and rough, with long, dark horn bending back over the head, was tethered here and there; this comes from the interior jungles. I have often noticed confusion between the buffalo and North American bison. I take it that a true buffalo is a domestic animal, ox-like, with neck formed for the yoke, and distinct hump above the shoulder. I think they are distributed through Asia, parts of Africa, and a limited portion of Southern Europe.

Returning on board ship in the afternoon, I was interested for an hour in the traffic of precious and non-precious stones diligently carried on. Merchants dressed in picturesque costumes exhibited their goods all over the decks. I could see at once that many stones were sham; on the other hand, real ones could be bought by the initiated. A good many sapphires set and unset were on sale, colour inferior, and hardly an unflawed stone. Prices asked were three times the value, but by waiting until time was nearly up, and by dint of hard bargain, cheap purchases can be effected. The best sapphire I saw bought was large enough for single-stone, gentleman's ring, pale in colour, certainly flawed, but well cut; price given was £6. This could not be dear, yet I would not have given the price myself. Opaque moonstones and cat's-eyes, good and bad, were plentiful. Small pearls in numbers, but all had been strung, I noticed. Alexandrine, green in daylight, lighting up pink at night, was offered me. It was true crystal, but more than that I cannot say. What diamonds were real appeared to have a yellow tinge. The topaz-cut stones shown to me were all artificial. A chrysolite (or is it chrysoprase?), clear olive-green in colour, greatly attracted me. But amid these few gems there

must have been hundreds of shams. I saw a would-be moonstone ring offered for twenty-five shillings afterwards sold for eighteen pence. One fellow pestered me to buy "an unset turquoise"—it was a bit of pale yellow glass, intended to represent a topaz; he was a green hand in the trade. Half-hoop sapphire rings I could have bought for £1, though they offered originally at £4; but the stones were inferior, and all flawed. Many passengers were most hopelessly taken in, and without special knowledge or reliable advice I recommend travellers to steer clear of the Ceylon gem trade.

Alas! too soon the time arrived for departure. In a few days this will, I trust, be posted at Albany, King George's Sound.

C. PARKINSON, F.G.S.

Equator, *Indian Ocean*.
January 24*th*, 1888.

THE ECONOMICAL PRODUCTS OF PLANTS.

KAVA ROOT.—This is the root of *Piper methysticum*, Forst. (*Macropiper methysticum*, Miquel), a native of the Society and South Sea Islands, where it is largely cultivated for the sake of its roots. It is a trailing succulent species. Leaves alternate on short petioles, ovate-cordate, equal-sided, subacute, 9–10-nerved. Flowers in axillary catkins; the males in solitary, and the females in clustered catkins. Root rhizinose, thick, woody, rugged, with a slightly pungent flavour, and narcotic properties. A tincture of it is prepared and used in cases of chronic rheumatism and other complaints. But it is more highly appreciated for the sake of an abominable and stimulating beverage which it yields. The most approved method of its preparation is briefly described below. Large quantities of women and girls are employed to chew pieces of the root, and, when well masticated and mixed with saliva, it is ejected into large bowls called kava, or ava bowls (similar in shape to a boat), when it is mixed with coco juice, and allowed to ferment, after which it forms a very intoxicating beverage, which is largely consumed by the lower strata of society, both native and European; the whites being especially fond of it. The upper and more respectable part of the community entertain very repugnant feelings towards it. According to Dr. Lindley ("Veg. King." p. 518), "It is employed by the Otaheitans to cure venereal diseases; they make themselves drunk, after which very copious perspirations come on; this lasts three days, at the end of which time we are told the patient is cured."

The natives generally, always partake of it before they undertake any important business, or perform religious ceremonies, thinking undoubtedly they are thereby greatly assisted. In this respect, by the way, their example is closely followed by many of our highly-civilised whites at home, with material which perhaps is even more prejudicial to the system than kava. In the "Athenæum" for 1861, some excellent letters contributed by Dr. Seemann appeared respecting this plant, and some most amusing anecdotes are related in reference to its uses; he says, "The Fijians pride themselves on the non-intoxicating properties of kava, that it does not make the partakers quarrelsome, and that drunk in moderation it has no ill effect upon the system, but when used in excess it produces numerous skin diseases." And according to the same authority there is another closely-allied species, the root of which is used in the preparation of a beverage which Dr. Seemann describes as having a flavour of soap-suds, combined with jalap and magnesia, which is by no means a eulogistic description, the material itself is also unappreciated by Europeans.

Fig. 37.—Branch of *Manihot utilissima* (reduced).

Tapioca.—This important farinaceous food is obtained chiefly from the root of *Manihot utilissima*, Pohl (*Janipha manihot*, Humb., and *Jatropha manihot*, Linn.), which is commonly called the Bitter Cassava, or mandioca plant. The first mention is made of tapioca, by Piso, in his "Natural History of Brazil," p. 52; and the plant was introduced into this country in 1739, and is still found in our botanical collections. It exists at Kew, also in a dried state, while the various preparations from the root are exhibited in the No. 1 Museum there. It was originally a native of tropical South America, but is now largely

cultivated throughout all tropical countries for the sake of the starchy root, which in various forms constitutes a very important article of diet.

It is a small shrubby plant, growing from four to eight feet high. Root large, tuberous, oblong, fleshy and white, abounding in a milky, acrid, resinous juice, sometimes weighing as much as thirty pounds. Leaves palmately-partite, with from five to seven lanceolate acute divisions, smooth, glossy, glaucous beneath. Flowers in axillary racemes, monœcious. The root is usually collected when weighing about six or eight pounds, as the older it gets the greater is the amount of woody fibre developed; this size is acquired under good cultivation in about nine months after the young plants are established; although in some instances they are allowed to stand for sixteen or eighteen months.

Fig. 38.—Branch of *Piper methysticum* (reduced).

As I have intimated above, the root abounds in a peculiar poisonous juice, which is stated to be analogous] to hydrocyanic acid, and yet in combination with such a virulent substance a most wholesome food exists, and is obtained free from it; this is due to the volatility of the principle, and the facility with which it is destroyed by fermentation, while if any remain after this process is undergone, it is easily expelled by heat when the crude material is subjected to roasting. The old method of manipulation is as follows, and this is still largely practised now, although enterprising firms have called in the aid of the engineer, the result being that suitable machinery now exists in many districts, which is not only a great labour-saver, but the starch is more effectively and quickly removed, and a better sample is secured. After the roots are dug up, they are peeled and made into a pulp, and thoroughly washed in cold water, and when at rest the starch subsides, after which the water is drawn off, and the starch is heated on hot plants; the pearl tapioca being granulated. To obtain the cassava meal the roots are cleaned, grated, pressed, dried, sifted, and then slightly baked on an iron plate; thus prepared it swells considerably in water or broth, and is called "conaque." If, instead of drying the grated pulp, it is spread upon a hot iron plate, the starch and mucilage, by mixing together, consolidate the pulp and form a biscuit called cassava-bread, which is a very important and nutritious food, and is sold at a very cheap rate. These cakes are also masticated in the same way as the kava root, by the women, and ejected into large bowls, where it is allowed to ferment for some days, after which it is boiled and clarified, when it constitutes a very agreeable, but intoxicating, drink.

The following remarks upon the improved method of manipulation by machinery are taken from the "Gardener's Chronicle," June 17th, 1882, where other details are given respecting the cultivation of the plant in the Straits Settlements. "The roots being first divested of their woody tops, are thrown into a large revolving drum, in which pipes are so arranged that jets of water play on them as they are turned over and over, and gradually they reach the farther end of the drum perfectly clean, and empty themselves into a rasping machine, whence they emerge in the form of fine pulp, which is thrown direct from the rasper into another cylinder covered either with stout muslin or brass-wire gauze, through the sides of which jets of water are continually passing. By this process the starch is separated from the pulp, the starch passing through the muslin or gauze into a tank beneath, where further supplies of water send it through gutters to vats prepared for its reception, while the pulp is discharged from the drum into baskets and thrown into heaps, either for cattle feeding or manure. After the starch in the vats has

been allowed to subside, the water is gradually drawn off, fresh water supplied, the whole stirred up and again allowed to subside, and the water again drawn off. The treatment of the starch in this stage depends on the purity of the water used, as, unless the tapioca when prepared is of the purest whiteness, it can hardly be given away. After the starch has become sufficiently pure it is allowed to dry in the vats, whence it is cut out in cakes, and is then ready for the last stages of preparation. If tapioca flour is required, it is placed first on racks to dry, then on large, almost flat, tin sheets, which form the top of a brick flue, where an extremely gentle fire is kept up. If fluke tapioca is requisite, it is submitted to rather stronger heat in concave pans at first, whence it is moved to the previously-mentioned sheets, and kept turned over with wooden rakes, etc., until it assumes the fluke-like form so familiar to consumers in Europe. The flukes are then sifted, to separate the various sizes, and the prepared tapioca is ready for placing in the bags for shipment."

The Sweet Cassava Root.—This is the root of another plant named *Manihot aipi*, Pohl, which, though regarded by Pohl as a distinct species, is, without doubt, but a variety of the last species. The chief difference is in the root, which is of a most wholesome character, in contradistinction to the acridity of the bitter cassava. This is very remarkable, that such a difference should exist in different forms of the same species, but such it is in this instance, and the plant is largely grown, especially in tropical America, as an esculent; it is so harmless that it may be eaten raw without any fear of injurious effect, but it is usually boiled or roasted, and eaten as a vegetable, the flavour somewhat resembling that of fresh chestnuts. It is also employed in the preparation of an intoxicating beverage, called "Piwarrie," which is accomplished by scraping the roots into a pulp, from which the juice is expressed, which is allowed to ferment for a few days, when it is purified, and forms a very agreeable beverage. Cassava meal and tapioca are also obtained from the roots, but only in limited quantities, being less productive than the bitter root.

The dietetical value of tapioca is too well known to require any notice in this paper, except to say that, owing to its demulcent properties, it is especially valuable as a diet for the sick room, and for infants at the period of weaning.

J. T. RICHES.

YELLOW (OR RAY'S) WAGTAIL.—I am much obliged to Mr. Read for his remarks on the birds which visited my garden. It was late in September when I saw them; they were undoubtedly yellow not grey wagtails; some of them remained about for three days. I noticed they varied very much in size, so were no doubt (as he observed) two broods: some pied wagtails were in company with them.—*S. M. P.*

MY TELESCOPE.*

THIS little book is emphatically what it claims to be by its sub-title, "A Simple Introduction to the Glories of the Heavens."

In a preliminary chapter on the choice of a telescope, after recommending those who are not provided with a long purse to choose a reflector in preference to a refractor, the writer describes the constellation of the Great Bear, and shows how it may be used as an index to the heavens; then follows a chapter taken as a type of a star. Then the planets and their position in the solar system are very clearly explained. Next comes a description of the moon and its relation to the earth, and the work concludes with chapters on the fixed stars, the double stars, coloured stars and star clusters, and Nebulæ.

The chapters are brief, but the matter is correct, being distinguished throughout by accuracy and simplicity. Those who go through it with the aid of only a telescope of three-inches aperture will certainly long for a bigger book and a larger telescope.

NOTES ON THE EIGHTH EDITION OF THE LONDON CATALOGUE OF BRITISH PLANTS.

By ARTHUR BENNETT, F.L.S.

600*b*. Mr. Baker's plant was long ago commented on in the "Phytologist," it occurs abundantly at Flegg Burgh, near Filby, Norfolk, by some considered a hybrid between 600 and 598.

599 an added plant. Years ago reputed as British, denied, and fell out of notice. Mr. Toundrow gathered what Mr. Ridley, of the British Museum, considered the true plant near Malvern; it is generally a smaller plant than *E. obscurum*, and its leaves are different.

602 and 603 should be combined, as Mr. Watson long ago held. Practically no two British botanists separate them alike; whether we have the true alpinum (*E. lactiflorum*) of Hausknecht's Monograph must hereafter be proved.

609, alter authority to "Jacq."

623, alter authority to "DC."

648 should be *F. capillaceum*, Gilib.

625 is 559, 7th ed.

626 is 560, 7th ed.

630 is 561, 7th ed.

636 is 573, 7th ed.

638 and 639. Three varieties are here added; their characters will be found in Koch's "Synopsis of the German and Swiss Floras."

644 is 604, 7th ed.

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* "My Telescope and Some Objects which it Shows," by A Quekett Club-man. Roper & Drowley, Ludgate Hill, E.C.

645 is 606, 7th ed.

646 is 605, 7th ed.

669 is 596, 7th ed.

676 is 601, 7th ed.

677 is 602, 7th ed.

678 is 603, 7th ed.

693 is 629, 7th ed.

711 *a* and *b*, alter authority to "Syme."

715, alter authority to "Poll."

720, alter authority to "Huds."

729 should have the small "s."

740 and 741, alter authority to "Gærtn."

760 should be *D. candidissima*, Desf.

772 *b* a variety found in Warwickshire, etc., with narrower-cut leaves and whole plant more gracile.

777 should be *P. officinalis*, Mœnch.

781 *b* a var. found in the Channel Isles, Cork, Ireland, etc., with radiant ray-florets.

786 *b*, a similar variation to the last.

787 *b*, var. with deeper-cut leaves, lobe at end larger, etc.

792 should be spelt *S. spathulæfolius*, DC.

794 *b*, var. with cottony-webbed heads.

798 would be better named *C. tenuiflorus*, Curt. the old name.

Carduus and Cnicus. Personally, I think the use of these two genera unwarranted, the distinction between simple and feathery hairs of the pappus is too artificial.

800 *b*, authority should be "Gren."

801, alter authority to "Willd."

802, alter authority to "Roth."

803, alter authority to "Willd."

804, alter authority to "Roth."

808, alter authority to "Willd."

809 *b* is a var. with stiff spiny leaves, growing especially abundant towards the base of Ben Lawers, etc.

810 *c* was described by Mr. Jenner in the "Transactions of the Edinburgh Botanical Society."

827 is 754, 7th ed.

834 is 772, 7th ed.

836 *b* is 774 *b*, 7th ed.

851. Mr. Backhouse now divides *H. Anglicum* into four forms, instead of three, as in 7th ed.

858 is an added species from the Grey-marestail, Dumfries-shire, found some years ago by Mr. Backhouse. It also occurs in Caithness, and perhaps in Perth?

859 *b* and *c* are two vars. from W. Sutherland, determined by Dr. Almquist.

860. Whether we have typical *H. cæsium*, of Fries, in Britain is yet perhaps uncertain. *H. Smithii* is the plant ordinarily named as *cæsium* by British authors. *C* is a var. (and a striking one) gathered on the Great Orme's Head, Carnarvonshire; it has narrow, deeply-cut leaves, and seems to me ill-placed under *cæsium*.

867 is an added species described by Dr. Boswell, in the "Report of the Botanical Exchange Club and Edinburgh Transactions," formerly named as *strictum*. It occurs plentifully in Glen Dollar, Clackmannanshire.

868 is an added species first found by Mr. F. Hanbury, in Caithness, since in Sutherland and Orkney. Named by Dr. Almquist, and since confirmed by Dr. Lindeberg, who calls it "forma latifolia."

870 is the old *H. Borreri*.

871, *H. strictum* of English authors. It is quite undecided what name our plant should bear, as it seems not to be the true plant of Fries.

888, alter authority to "Linn."

891 *b* alter to *lævipes*, Koch. *C. angustifolia* is a narrow-leaved form, gathered on the coast of Norfolk, near Wells. I was enabled to identify this through specimens kindly sent me by Dr. Buchanan, of Bremen, from the East Friesian islands.

901 *b* is a minute *f* from the downs of the southern counties.

905 *c* is a beautiful var. of the species found in West Ireland by Mr. A. G. More; it has flowers an inch over.

910 has two fresh names given to it.

921. A better name for this is *E. Mackaina*, Bab.

927 should be *Dabeocia*.

926 is 834, 7th ed.

930, alter authority to "Linn.," and in 932 to "Gray."

933, *H. monotropa*, Crantz.

935 is 1058, 7th ed.

936 is 1060, 7th ed.

941. This should read *a. acaulis*, Hill; *b. caulescens*, Koch.

947, alter authority to "Soland."

961 *b*, alter to *diversifolia*, Ait.

967 *b* is the form so often named *E. latifolia*, Smith, and figured as such in "Eng. Bot. Sup."

970 *b* is a var. found by Mr. Townsend in the Isle of Wight.

971 is an added species, easily recognised by its stamens being inserted at the base of the corolla.

976 *b* is a var. strongly simulating *G. campestris* and flowering in May and June.

983 should be *C. Germanicum*, Jacq.

993, alter authority to "Gray."

995, alter authority to "Relhan," and *b* to "M. et R."

999, alter authority to "Willd."

1002, an added species found near Kew, in Surrey, by Mr. G. Nicholson.

1008, substitute a small "s."

1015 *c* is a yellow-berried form.

1016 *c* is a greenish-yellow berried form.

1036 is 898, 7th ed.

1051 is 905, 7th ed; but perhaps *V. Tournefortii*, Vill., is an older name.

(*To be continued.*)

SCIENCE-GOSSIP.

We much regret to state that, owing to a severe domestic affliction, Mr. John Browning has been unable to send us his usual monthly article.

A correspondent writes—"Can you help to raise a howl of execration against all who shoot immigrant birds until some more of us may have the happiness to see them alive? We do not want to see them stuffed." We wish we could!

Mr. C. J. Watkins, King's Mill House, Painswick, has forwarded us his list of microscopic objects, chiefly entomological, which will prove of great value to students, particularly those who cannot collect their own material. We cordially recommend it.

Australians are delighted because Mr. Saville Kent (formerly naturalist at the Brighton and Great Yarmouth Aquaria, now Inspector of Fisheries in Tasmania) has discovered that the small fry, people at the latter antipodal place had been devouring under the idea they were "whitebait," is really the young of the true anchovy. Before that they only made the acquaintance of anchovies in bottles; and you cannot get much natural history information from the post-mortem examination you make at breakfast and supper.

In these æsthetic days we are always looking out for new designs. The simple process introduced by Mr. Outerbridge, of Philadelphia, will therefore probably be extended. He has been in the habit of casting molten iron upon lace, fern leaves, &c., with such success that no other ornamental patterns are requisite for the surface. The objects are slowly heated, or carbonised, before casting upon them.

It is stated that our London firemen are to be dressed in clothing made of asbestos, which is thoroughly fireproof. The plan has been successfully adopted with the Paris fire brigades.

A German chemist has discovered a new gas—hydride of nitrogen. It is exceedingly stable up to a high temperature, and has a peculiar odour. It is soluble in water, and possesses basic properties. We shall hear more of it before long.

They have commenced crushing the gold quartz at the Dolgelly mines. The first experiments were made on 625 lb. of material, which is said to have yielded 18 oz. of gold.

Some sensation has been created by the announced discovery of natural gas near Peterborough. There are a great many clay pits about the neighbourhood, and it was found that the bricks made from the lower beds (which were of a darker colour) required less force to burn them. Moreover, whilst these bricks were being burnt they emitted a burning gas. The gentleman who announced the above facts suggested that the Peterborough people should bore down to see whether natural gas existed beneath the city. The latter is perfectly unnecessary. Any geologist would have told him that the dark clay or soft black shale from which the bricks are made is due to diffused organic matter, and that the latter, when duly heated, gave off sufficient inflammable gas to be visible. In the natural gas stores of Pittsburg, nature has done for the much more ancient black shales what the brick-kilns of Peterborough did artificially—the heat in the interior of the earth distilled the natural oils and drove off the natural gases, both being the residue of ancient life.

Possibly John Ruskin's dream may some day come true, and every craftsman again be able, thanks to electricity, to follow his craft at home. It is proposed to let electric power from central stations to craftsmen. An electro-motor of one-horse power can be purchased for £20, and its cost would only be a farthing an hour. The motor might be paid for, as sewing-machines are, at so much a month. In America and Geneva, the artisans are already availing themselves of the new energy in carpentering, tailoring, bootmaking, watchmaking, etc.

The Metropolitan Board of Works are about to experiment, at Crossness, with the proposed scheme to disinfect sewage by means of electricity. It is stated that if a current of electricity is passed through a tank of sewage, it disinfects, cleanses, and precipitates all the solid matter.

It has just been demonstrated before the French Academy that the virus or poison of rabies in dead dogs which have been buried more than a fortnight retains all its virulence, and will kill in fifteen days after inoculation with it. This shows the necessity of burning the carcasses of animals which have died from contagious diseases instead of burying them; for it has been shown that earthworms bring up to the surface the infected organic matter of such buried bodies.

The Museum of the Natural History Society of Northumberland and Durham at Newcastle-on-Tyne is pre-eminent for containing the Hancock collection of birds and the Atthey collection of coal fossils, beside many other specimens, animal, vegetable, and mineral. Alderman Barkas, F.G.S., has been giving popular explanations of the objects to young people, which have been highly successful, nearly a thousand persons having responded to his invitation.

The manner in which certain natural deposits of carbonate of soda have been formed in Egypt and elsewhere was explained by the celebrated chemist Berthollet, on the assumption that an ancient sea had left the marine salt over strata of lime. This theory

has recently been tested by a well-known French chemist, who has demonstrated that natural carbonate of soda is produced in all permeable calcareous soils in proportion to the quantity of marine salt contained in them. This being the case, common salt ought to be a valuable manure on all limey soils where plants are to be grown which require carbonate of soda as their mineral food.

LONG distance telephonic communication has hitherto been a difficulty, but it seems as though the recently introduced bronze wire will overcome it. At any rate, it is expected that by the 1st of July next, long-distance telephonic connection will be made between Paris and Marseilles, over 500 miles of wire. Telephonic communication has already been effected between Brussels and Paris, which is nearly half the above distance.

TALKING about telephoning, there was a novel application of it the other day in an American paper devoted to the interests of animals. A gentleman owned a favourite dog, which happened to be at his father's office when the owner was too ill to venture out. So the owner asked them to hold the dog up to the telephone. The dog being held, the owner whistled, the creature knew the call and pricked up its ears, whereupon it was bidden to "come home." It was then put down, the door opened for it, and away it trotted off "home," as it was telephonically ordered!

IT is stated that the Dutch are entertaining the grand engineering idea of pumping out and dyking off the waters of the Zuyder Zee, and of thus recovering from the ocean the vast area submerged by it five hundred years ago.

MANY colliery explosions have doubtless been caused by the use of gunpowder for blasting. To overcome this, certain lime-cartridges were invented. Now it seems probable that Nobel's gelatine dynamite in Settle's water cartridges will be used, as neither spark nor flame is emitted by them.

M. TRAUVELOT has supplemented the observations of several astronomers that, so far from the rings of Saturn being stable, they are, on the contrary, exceedingly variable, and subject to constant fluctuations.

IN these days there are only two classes of people—those who cannot get enough to eat, and those who habitually eat too much. The recent experiments of Messieurs Henriot and Richet, therefore, will be interesting to the latter. They have been investigating the influence of various diets on the interchanges of gases in respiration, and find that respiration increases with the increase of food, but only when the latter consists of hydrates of carbon. The interchange of the gases is but slightly affected by a nitrogenous and fatty diet. Feculent substances increased the absorption of oxygen, and therefore cause a larger amount of carbonic acid to be given off. (Think of that, ye who delight in "high" game and venison.)

THE veteran Professor Prestwich, whose name is historically associated with the vast strides made by Geology during the last half century, has resigned the Geological Professorship at Oxford, and Professor Green, of the Yorkshire College of Science, reigns in his stead. Professor Prestwich was originally a wine-merchant, and it was when following that business that he made nearly all his discoveries. He was elected to the Chair of Geology at Oxford in the place of the late Professor John Phillips.

IT has recently been proved in the Zoological Gardens at Halle, that hybrids between the jackal and the domestic dog are capable of reproduction among themselves.

AN Electric Club has been formed in New York, which was duly and brillantly opened on the 31st of last month. As we should naturally expect, it is fitted up with all sorts of electrical novelties. You ring the bell by standing on a metal plate, and the door is then unlocked by electricity; chops and steaks are cooked on electric gridirons; boots and shoes are blacked and polished by a machine worked by an electric-motor. The clocks are wound up by electricity; and even the club piano can be played by the same versatile agent!

WE have just lost one of our best botanists in the death of Mr. John Smith, of Kew Gardens, at the ripe age of ninety-two years. Most people are acquainted with his books on Ferns, of which he made an especial study. He retired from active work at the Gardens twenty years ago, but not until he had largely helped to make Kew the celebrated place it is.

PASTEUR has gone in thoroughly for stamping out the rabbit pest in Australia, and he apparently hopes to win the £25,000 offered by the New South Wales Government to him who stamps them out. There is an ingenious scheme by which the rabbits are perpetuated. A price per head is offered for them, and a new industry has sprung up at the Antipodes. It pays the rabbit-exterminators to keep the rabbits from extinction. In case of the last sad event their occupation would be gone. In one colony the Government offered so much per dozen rabbit-heads, in another for so many tails. Forthwith there was business done, the rabbit-catchers in one colony dealing in tails, and those in the next in heads, exchanging with each other, in order to get the Government grants.

A RUSSIAN scientist states that he has discovered Bacilli, or germs, in hailstones, and he calculated

that in a cubic centimetre there was no fewer than 21,000 of them.

ASTRONOMERS have always been much interested in the "Great Red Spot" on the planet Jupiter. Mr. Denning is of opinion that it represents an opening in the aerial envelope of the planet through which we see the denser vapours of its lower strata. The lighter tints observed during the last few years are probably due to the filling in of the cavity by the encroachment of the clouds in the vicinity. Parts of some of the more prominent belts display an intense red hue, like that of the old red spot, and they may be due to the same causes.

THE largest steamship ever constructed in Ireland has just been completed by Messrs. Harland & Wolf, for the Peninsular and Oriental Company. It is called the "Oceana," and is 466 feet long, 6380 tons gross register, with engines working up to 7000 horse-power. She is said to be capable of attaining the speed of sixteen knots an hour. The new vessel left London with the mails on the 9th of March.

IT is not long since it was discovered that the basic slag of our iron furnaces (hitherto a perfectly waste material) contained so much valuable phosphates, that when it was ground to a fine powder it made a splendid artificial manure. The Staffordshire Steel Co. are now grinding two hundred tons of it a week, and the selling price runs up to forty-five shillings per ton.

IT is proposed to construct a bridge over the Hudson, with a single span of 2850 feet, to be 145 feet above high water, and have a total length of 6600 feet. The cables are to be carried on towers 500 hundred feet high.

BARON RICHTOFEN, Professor of Geology in Berlin University, and famous as one of the scientific explorers of China, died on the 6th ult., in Silesia, at the early age of 53.

WE have received a copy of "A Pocket List of British Marine Mollusca," compiled by the Rev. Geo. Bailey, F.R.M.S. It is excellently got up, and convenient for the pocket. Price 6*d.*, published by Tindall & Co., High Street, Newmarket.

WE are pleased to notice that Mr. C. B. Plowright is publishing "The British Uredineæ and Ustilagineæ" (illustrated with woodcuts) in a vol. of 270 pages. Price, to subscribers, 7*s.* 6*d.*, to non-subscribers, 10*s.* 6*d.* Forms of subscription to be had of Messrs. Kegan Paul & Co.

A REMARKABLE paper was recently read before the Liverpool Astronomical Society by the Rev. F. G. Grensted, on "A Theory to account for the Airless and Waterless condition of the Moon," to which are appended some geological and physical notes, by T. M. Reade, F.G.S.

PROFESSOR I. B. BALFOUR (of Oxford University) has been elected Professor of Botany in the University of Edinburgh, the chair formerly held by his distinguished father.

A NEW work on Astronomy by R. A. Proctor is announced to appear in 2*s.* 6*d.* parts, the first part to be published early in April. Publishers, Messrs. Longman & Co.

SOME time ago we noticed the death of Mr. Thos. Bolton, the widely-known purveyor of living microscopic objects. We are glad to observe that his two sons, Mr. T. E. Bolton and Mr. S. P. Bolton, are carrying on their father's extensive business.

PROFESSOR HERDMAN, of Liverpool, has just published an interesting brochure, entitled "Puffin Island Biological Station; its Foundation and First Season's Work."

ZOOLOGY.

BALLAST-BAGS OF SEALS.—At a recent meeting of the British Naturalists' Society, Dr. A. J. Harrison, in a paper on "The Ballast-bag of the Seal," said: "According to the fishermen, the Otariæ have an internal pouch known as the 'ballast-bag' because it is always found to contain a number of rounded stones. The presence of these is accounted for by saying that when the animals grow very fat, they become so buoyant as to be unable to sink below the surface of the water without the aid of some ballast, which they secure by swallowing stones." This theory implies the possession by the seals of considerable reasoning power. Observations have shown that the so-called ballast-bag is only the stomach; and accordingly some people have suggested that the stones are intended to assist in the trituration of food in somewhat the same manner as in the gizzard of fowls. Other persons suppose the stones subserve no useful purpose, and are accidentally introduced with the food, or in play. In the seals and sea-lions at the London Zoo similar rounded stones have been found, large numbers of which are quite foreign to the geographical character of the district. A Newfoundland seal, which died at the Clifton Zoo, in 1886, was examined by Dr. Harrison, who found in the stomach, gravel, nuts, and pieces of stick.

UNRECORDED DAPHNIAS.—Having read in this month's number of your paper an article on "Unrecorded Daphnia" (p. 37), I beg to say that, in connection with some new discoveries in Fish Culture, made at Geneva, I have specimens of Daphnia ("pulex," I am told) which might be of interest to Mr. C. Rousselet, resembling, as they do, the drawing he has sent you. I shall be happy to supply a few specimens, should the matter be of

sufficient interest, and I enclose some printed matter giving particulars of the discoveries referred to, in view of the remarks made by Mr. W. A. Carter, at Forest Hill, recorded in the following page of your journal under the heading of "Science-Gossip."—*James Davison.*

Rabbit Swimming a River. — On 17th of February last, while waiting to see the university boat, I witnessed what is I believe a rather uncommon occurrence. It was an extremely cold day, several men were trying the skill of two fox-terriers in hunting a wild rabbit. The rabbit was very hard pressed, and, notwithstanding there were a number of people on the bank, it ran past them, closely followed by the dogs, down the bank into the river (the dogs however did not take the water), and swam bravely across to the opposite side, where there were several people waiting to receive it; one of them lifted it out kicking vigorously.—*F. L., Cambridge.*

Lesser White Fronted Goose in Somerset. —I see Mr. Gyngell, of Wellington, in this county, Somerset, has recorded in the March number of Science-Gossip the occurrence of the lesser white fronted goose at West Buckland. He kindly sent the head, legs and wings of this bird, all that remained of it, to me for the purpose of identification. I certainly made the parts sent to be parts of the lesser white fronted goose (*Anser erythropus*), the small size of all the parts sent, when compared with the same parts of any other of our grey wild geese, at once led to that conclusion; moreover "the straight ridged bill forming a line with the forehead," * which was very marked in the head of this bird, is a very decided distinction. The white on the forehead though not very clearly marked having some brown feathers intermined, probably owing to the bird being a young bird, reached farther on the forehead than in *A. albifrons*, extending quite as far as the eye. The bill, legs and feet, and wings were much smaller than any of our grey wild geese. I compared them carefully with skins of *A. albifrons*, *A. cinereus*, and *A. segetum*, and also with my live *A. lonchyrhynchus*, and could not make them agree with either. They agree however very exactly with the measurements of those parts given by Dresser, in his "Birds of Europe," namely, tarsus 2·2 in. culmen 1·3. The wing I could not take a measurement of as there was not sufficient of it sent me; but, compared with the other skins mentioned, it was very short, and the quill feathers were smaller. I did not record the occurrence of the bird anywhere, as I took it for an escape, one wing to all appearance having been pinioned. I admit I did not in passing my fingers along it find for certain that a joint had been taken off, but the quill feathers were some wanting altogether, and one or two cut very short off. There was no primary quill feather at all on that wing. Mr. Gyngell has however since written to me to say, that he has since seen the person who shot the bird, and he reports that it was perfectly able to fly, and when first put up flew nearly a mile before it pitched again.—*Cecil Smith, Lyndurst House, Somerset.*

* See Yarrell, ed. 4, v. 4, p. 263.

Lacuna Pallidula, Da Costa.—Referring to Mr. Gubbins' enquiries in your January issue, I would refer that gentleman to vol. iii. of Jeffery's "British Conchology," where he will find the habitat of the species stated to be "on Laminariæ and other sea-weeds having flat and smooth fronds, at low-water mark, and in a few fathoms seawards, chiefly on our southern and western coasts," nothing being said regarding its frequency of occurrence. *L. pallidula* may be a commoner species than supposed. In the West of Scotland it will usually reward search on the surfaces of the "waving tangles" at spring tides, where immature specimens are sometimes plentiful. *L. divaricata*, Fabr. (= *vincta*, Mont.) is a much more abundant form. It is a favourite food of wild ducks, and may be found in their crops. I have taken it in numerous localities from the Butt of Lewis to the Island of Arran. *L. puteolus*, Turt., is not in the West of Scotland, a common species: any I have obtained—and they have been of var. *conica*, Jeffr.—have been by dredging. It seems to be abundant in the English Channel, where at low tide in the neighbourhood of Teignmouth a correspondent has obtained for me a large series, with great variety of marking. *L. crassior*, Mont., is widely distributed, but local species occurring generally in deep water.—*A. Somerville, B.Sc., F.L.S., Glasgow.*

Limnæa Palustris, var. albida, Nelson.—I found two specimens of this variety in a pond near Doncaster last year along with a large number of the type of the ordinary colour.

Sphærium Rivicola, var. flavescens, Pascal.—Mr. J. A. Hargreaves, of Shipley, has shown me two specimens of *S. rivicola* of a yellow colour from Lancashire, which I take to be this variety.

Helix Hortensis.—Last summer I found a specimen of *H. hortensis*, with a dark brown peristome. This, I presume, is the variety called by Kreglinger *fasco-labris*. I have not seen it recorded before in any British list.—*Geo. Roberts.*

Vinegar Eel.—In consequence of the author of this interesting paper not having sent his address, no proof could be forwarded to him. Mr. Thomas now writes to make the following corrections:—"serrulated" instead of "sacculated;" "broad pouch" instead of "brood pouch;" "excretary" instead of "excretory."

Bats in Scotland.—I wonder if any of your Scotch readers are within easy reach of Crookston

Castle—if it still exists—in Renfrewshire, and whether naturalists are allowed to visit it, because there is an interesting point to be cleared up in connection with it. In the old "Statistical Account" it was said to be the home of the lesser horse-shoe bat (*Rhinolophus hipposideros*), and if so it would be the only known Scotch locality for the species, and so the most northern point of its range in these islands. I should not think of disputing the accuracy of the record, as the writer was acquainted with other species, but the late Mr. Alston, a great authority, refused to admit this bat into the "Fauna Scotica." The bats of Scotland appear to be the following:—The lesser horse-shoe bat: Renfrewshire. The long-eared bat: common; as far north as Aberdeen. The pipistrelle: common; as far north as Sutherland. Daubenton's bat: common; reported from Kirkcudbright, Dumfries, Renfrew, Lanark, Fife, Aberdeen, and Banff. Natterer's bat (reddish-grey bat): rare: Argyle and Midlothian. The whiskered bat: rare; I have seen a specimen from Rannoch, Perthshire: not before recorded; but probably mistaken for the pipistrelle. In conclusion, I would urge your readers to examine all bats that come in their way, as a greater knowledge of the British species is much to be desired.—*J. E. Kelsall, Fareham, Hants.*

MICROSCOPY.

Hardy's Flat Bottle.—In the description Mr. Rousselet gave last month of the flat bottle, he omitted to mention the cork, which is not only useful but a necessary item to complete the "bottle." This I generally make from the end of the internal piece of rubber, so that it fits naturally. With the cork inserted the bottle with contents can be safely carried in the pocket, and can also be placed on the stage of the microscope lengthwise, so that it does not require holding. For this purpose ¾ inch thick is too much, it is better to use rubber of ⅜ to ½ inch. To clean the "bottle," use a stiff wire with some cotton cord round the end.—*J. D. Hardy.*

The Royal Microscopical Society.—The Feb. "Journal" contains papers on "The Fresh-water Algæ of the English Lake District," by A. W. Bennett, F.L.S., "Note on *Micrasterias Americana*," by W. M. Maskel; and "Note on the Minute Structure of *Pelomyxa palustris*," by G. Gulliver. There is in addition the usual excellent "Summary of Current Researches" in things microscopical.

The Quekett Microscopical Club.—General satisfaction was felt at the announcement that the Quekett Microscopical Club was going to resort to its good old ways, and have a *soirée*, or scientific evening. This came off on the 9th March, in the Library of University College (thanks to the council of the College), and was largely attended; not a few ladies being among the visitors present. The exhibition was uncommonly good, as the Queketters, who individually possess many beautiful and rare slides, determined to do their best, in competition with the recent scientific evening of the Royal Microscopical Society. So their treasures were brought out, and very many beautiful and uncommon objects were on view. Some of the best displays at the scientific evening above referred to, were again repeated, giving great satisfaction. The list of objects would be too long for me to recapitulate, but I must mention one or two of special interest. *Hydra tuba* was on view, and giving off its medusa-like buds freely. One of these was shown in a separate microscope. Mr. Dodswell had not forgotten to bring his bulblet of Chara, in which the remarkable cyclosis was going on. Mr. Charters White, in one of the bays of the room was showing off his micro-photographs as lantern slides: thus quickly putting Dr. Crookshank's ideas, as set forth at the Royal Microscopical Society's exhibition, into practice. Mr. Parsons had the curious and obscure polype, which is suspected to be the cause of the annual appearance in the Victoria Regia Tank of the Royal Botanic Society of the unique fresh-water medusa (Lymnocodium) which is such a puzzle to scientists. Mr. Enock's drawings and preparations were again before appreciative observers. Several very fine slides of spider's eyes were noticed. But the whole exhibit was so excellent that one frequently heard the question, "Why cannot the club do this sort of thing oftener?" Such a display as this shows that the Queketters are not quite gone to sleep yet. Let us hope they will wake up, and repeat the pleasing results of many years ago. It is true many of the old friends' names are not now on the list, but still, many are left, and their *esprit de corps* is strong yet.—*S. J. McIntire.*

BOTANY.

Œcidium Aquilegiæ in America.—Last summer I found an Œcidium growing on the leaves of *Aquilegia cærulea*, James, near the head of Swift Creek, in the Langre de Cristo Range, Custer Co., Colorado. This specimen has been very kindly determined for me by Dr. W. G. Farlow, of Cambridge, Mass., who writes: "It is *Œcidium aquilegiæ*, Pers., which has not been recorded before in this country, I believe." There are several species of Aquilegia in the Rocky Mountains, but *A. cærulea* is the most abundant and perhaps the most beautiful of them all, its pale blue flowers being conspicuous on the mountain-sides under the fir-trees in July and August, at an altitude of ten thousand feet and above. The tall stalks of *Primula parryi* bearing pink flowers are also frequent by watercourses in the same situations.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

YEW-TREE POISONING CATTLE (p. 44).—I am old enough to remember an unsettled controversy on this point in "Gardener's Chronicle," 1848. It came up again in 1854 and was then closed in two letters, the conclusion being that we must admit the leaves of the yew to be "poisonous," but they are not fatal unless taken in quantity in a fasting stomach. It would be desirable for your recent correspondent to tell the public whether the horses of which he wrote were all fasting or not. I am not able to search the G. C. later than 1854.—*W. Gee, Freshford, Bath.*

GEOLOGY, &c.

THE DICYNODON IN THE ELGIN SANDSTONES.—For many years past this formation has been a much-debated ground to geologists. Some affirmed it was the new red sandstone—others, that it must be the old red. Geology is expected to throw light on the modern doctrine of evolution. The latter theory maintains, above all things, the gradual development of life on our earth. The debated formation above alluded to looked like the old red sandstone; but there had been a little fossil terrestrial reptile, of high organisation, called Telerpeton, found in it many years ago. Now, according to the law of succession of life upon the earth, this reptile had no business to be found in the old red sandstone formation. Its proper place of appearance was much later on. Other incidental fossil remains were found associated with the Telerpeton, all of which suggested them to be of much later date than the old red. When the British Association met at Aberdeen in 1885, there was an excursion to the quarry in the Elgin sandstone where the reptilian remains had been found, and a geological discussion took place. Within the last few weeks there has been a new find of fossils in the same quarry. These will not only settle the debate, geologically and evolutionistically, but they are full of novelty besides. In South Africa there is a well-known formation, which has been fully regarded all round as equivalent in age to the new red sandstone of Cheshire and Warwickshire, that has produced a variety of fossil extinct reptiles, which have not hitherto turned up anywhere else. Among the recent "finds" in the Elgin sandstone of Scotland are the remains of the chief fossil reptile hitherto found only in South Africa — a creature called Dicynodon. So a few extra fossil bones have practically settled two generations of geological discussion, and Evolution is again justified of her children.

POST-GLACIAL TIME.—A paper on this subject by T. Mellard Reade, C.E., F.G.S., has just been read at the Geological Society. The author showed that there exists on the coast of Lancashire and Cheshire an important series of post-glacial deposits which he has studied for several years. The whole country to which his notes refer was formerly covered with a mantle of low-level marine Boulder-clay and sands, and the valleys of the Dee, Mersey, and Ribble were at one time filled with these glacial deposits. These glacial beds have been much denuded, especially in the valleys, where the rivers have cleared them out, in some cases, to the bed rock. Most of this denudation occurred during a period of elevation succeeding the deposition of the low-level Boulder-clay. On this eroded surface and in the eroded channels lay a series of post-glacial beds of a most interesting and extensive nature. They consist of estuarine silt and Scrobicularia-clay covered by extensive peat-deposits, containing the stools of trees rooted into them. Upon these lie, in some places, recent tidal silts, and on the coast margin blown sand and sand dunes. The series of events represented by the denudation of the low-level Boulder-clay and the laying down of these deposits is as follows:—1st, elevation succeeding the glacial period, during which time the Boulder-clay was deeply denuded in the valleys. 2nd, subsidence to about the 25-feet contour, when the estuarine silts and clays were laid down. 3rd, re-elevation, representing most probably a continental connection with the British Isles, during which time the climate was milder than at present, and big trees flourished where now they will not grow. 4th, subsidence to the present level, the submersion of the peat and forest-beds, the laying down of tidal silt upon them, and the accumulation of blown sand along the sea-margin extending to a considerable distance in an inland direction. It was estimated, from a variety of considerations, that these events, all posterior to the glacial period, represent a lapse of time of not less than 57,500 years allotted as follows:—40,000 years for the elevation succeeding the glacial period measured by the denudation of the Boulder-clay in the valleys, 15,000 years for the accumulation of the estuarine silts, clays, peat, and forest beds, and 2500 years for the blown sand.

THE GEOLOGISTS' ASSOCIATION.—The last part of the "Proceedings" contains papers on "The Formation of Agates," by W. J. Lewis Abbott; on "The Geology of Cornwall," by T. H. Collins, and "Notes on the London Clay and its Deposition," by J. Starkie Gardner, etc.

NOTES AND QUERIES.

ECCENTRICITIES OF INSECT LIFE.—The following notes may interest your correspondent, Peter Kirk, and others:—The past season has been a fairly good one for entomologists. One peculiar feature in the abundance of lepidopterous insects has been the recurrence of the yellow underwing moth (*Tryphæna pronuba*) in fairly large numbers. This moth was

very plentiful some five or six years ago, since which time it has not occurred in anything like full force of numbers. At the time we mention we have seen as many as sixty at a time feasting at one patch of "treacles;" in fact it was quite a nuisance, shouldering off every other insect which came to the sweets, for it is a large, strong insect, and not to be despised as far as beauty goes; but when occurring in such vast numbers as it does occasionally one is apt to vote it a nuisance. At the time we speak of we were compelled to kill them by hundreds; it was of no use to drive them off, they were there again directly, so slaughter was our only defence against them. The toads did not mind, though. We found several sitting at the foot of each tree greedily gobbling up such insects as fell down from under our thumb. It is surprising what remarkable instinct these creatures display in this matter; they will assuredly discover trees that have been "treacled," and there they sit at the foot. Woe is it to any intoxicated insect happening to fall to the ground; it is snapped up in an instant. We should, perhaps, explain to such of our readers as do not understand "treacling," that it is a method of capturing certain kinds of moths by alluring them within reach by means of a sweet bait composed of rum and treacle. This is brushed on the trunks of trees, and is quickly scented out by the insects, who congregate to sip the sweets, and thus are easily captured. The toads, however, are not the only purloiners of our treasures; the bats soon find out the game, and will pick off the insects from the trunks of the trees as they pass to and fro in flight. We have seen the cross-rail of a fence under a "treacled" tree literally covered with the wings of moths; the bat only devours the soft, juicy bodies, clipping off the wings neatly and quickly. It is a peculiar characteristic of insect life, that certain species will occur at times in great profusion (as above), then disappear for years altogether, or only be seen in meagre numbers, again appearing, as at first, in vast numbers. This peculiar trait in insect life cannot be satisfactorily accounted for; many hypotheses have been put forward, but in no instance have they been substantiated by actual facts.—*W. Finch, jun., Nottingham.*

*** The above from my own pen appeared in the "Nottinghamshire Guardian" quite recently.

Fox Eggars.—For the benefit of the writer of the query respecting "Fox Eggars," in Science-Gossip for February, I append the following cutting from my article on "Lepidopterist's Work" in the August issue of Science-Gossip, 1886.—"Many larvæ taken this month will be noticed to feed slowly and in a very deliberate manner. If kept, these will prove to be hybernating larvæ. It is often difficult so to preserve the conditions of nature throughout the winter as to keep these larvæ in health. They frequently die, refusing all food in a most obstinate manner. Of these larvæ I will merely mention those of the fox-moth (*B. rubi*), which are exceedingly handsome and well worth preserving. I have found them in great numbers on the Lincolnshire coast, close to the sea, feeding on brambles, etc. Yet, strange to say, I have never yet seen the cocoon or perfect insect there. If any of my readers possess a refrigerator they will be able to keep these larvæ throughout the winter by placing them therein; they hybernate 'full fed,' and spin up almost immediately upon emergence from the lethargic state. Judging from those I have kept, however, I should say that they are the favourite victims of the various Ichneumons." From the above it will readily be seen that the larvæ are hybernating, but I very much doubt whether they will be successfully reared.—*W. Finch, jun., Nottingham.*

"Nest of Australian Fly" and the New Zealand Spider Wasp, or Mason Fly.—The insect described by Mr. George Browne (see Science-Gossip for October, p. 239), is probably *Pompilus fugax*, which is, I believe, found in South Australia. However that may be, it is evidently closely allied to the New Zealand spider wasp (also erroneously called Mason Bee), and I therefore give a few particulars concerning our species, which may possibly possess some interest for your correspondent. The New Zealand spider wasp is, I believe, a species of Pompilus (*P. monachus?*), is black and shining with smoky-hyaline wings. It may be seen in abundance in many parts of the Colony. The nests which are frequently found in sheds, corners of verandahs, or any convenient crevice, sometimes even the living rooms, behind pictures, etc., are truly wonderful structures. As I have in my possession a number of nests, and have frequently had opportunities of watching the operation, I will give a short description of the mode of building. I one day watched several wasps on a preliminary tour of inspection, and observed them busily examining a number of chinks about the corners of a building; at last an angle formed by a stud and the weather-board was selected, the insects, for they sometimes work in pairs, flew away, but in a very few minutes returned, each carrying a pellet of soft clay of considerable size. This clay they at once proceeded to attach to the wall, working it well with their feet, and as soon as it was properly fixed they flew off for more. This proceeded till a small mud shelf had been made. On looking again about an hour later I found that a cell measuring half-an-inch had been nearly finished, and later in the day three such cells had been completed. I broke open the bottom one, and found it to contain a spider, not dead, but evidently paralysed by a sting from the wasp. On another occasion I was fortunate enough to witness the capture of spiders. As each cell is completed, a spider is placed in it and the egg must be immediately laid either on or in its body, for the wasp at once seals up the cell and proceeds to build another and so on. About ten weeks after the nest was finished I broke open the second cell and found a tiny whitish grub feeding on the body of the spider. It is seldom that more than one spider is found in a single cell, probably one is usually considered sufficient for the future grub, still in three instances I have found two comatose spiders in one cell, but they were small, and evidently the parent wasp was well able to calculate the amount of food likely to be required by each of her voracious children, and thus where only small arachnids could be secured, she doubled the number. During the whole time that building is proceeding, the wasps emit a steady buzzing noise, somewhat like that made by a blue-bottle, but shriller. The nests sometimes contain as many as twenty cells placed either in a single, double, or triple line, according to the convenience of the place selected. The whole of the nest including the partitions is of clay, usually when dry a pale yellow colour. The outside is well finished, and is corrugated and made to look somewhat like the sculpturing on a crayfish—each corrugation is covered with very fine striations caused by the builder's feet as she works the clay and cements the whole structure together. I do not wish to trespass on your space, and therefore will not now give a minute description of the cells, but send a photograph showing a nest built on the side and

shoulder of an empty medicine bottle as it stood on a shelf in the tool-house. The larvæ, as will be seen, have eaten the spiders, and reached the cocoon stage. In each cell were found portions of the legs and head of the spider, but every other particle had been devoured by the grub for whose sustenance he had been placed there. If spiders are capable of thought, what must be the state of mind of these unfortunate victims, paralysed and shut up in a dark room, awaiting the birth of their devourers, and what their sensations when the greedy larva starts feeding on their still living bodies?—*T. W. Kirk, Museum, Wellington, N.Z.*

TAILED MEN.—A correspondent alludes to the *os coccyx* in man, which recalls to recollection that our ancestors have had a constant predilection for men with tails. His Satanic majesty in pictorial exposition used to take the disguise of hoofs and tail; and certain fanatics in the days of Thomas à Becket had grim jokes about the tailed men of Stroud; but this appears as of yesterday, for I have before me a sketch of a Culdee tombstone, from "an auld kirkyard," at Keills, in Argyleshire, where the "Noroway lion" has a twin supporter in a tailed potentate, of ample brow, sitting on his buttocks, and sleeking with his left hand a tail that curls beneath his legs. This tomb of jarl or king is not so ancient, but one of its associates is very archaic, having concentric rings and scores; and considered as a group, in addition to defaced inscriptions, they all present picture-writing identical with that on the tomb-boards of North American chieftains, leading one insensibly back to the infancy of the human race when picture-writing was the fashion, and all the world was kith and kin. One might indeed on these grounds surmise these tailed men to be identical with some of those old Assyrian gods, who in the Cuneiform Inscription descriptive of the Deluge, as translated by Mr. George Smith, are thus graphically described as seeking refuge from such a calamity: "They ascended to the heaven of Anu. The gods with tails hidden, crouched down;" while the presence of sphinx-like creatures and elements of the Asiatic-European mythology in conjunction on the tombs would colour the conjecture. The cuneiform description of the Deluge is held to be more ancient than the days of Abraham, and consequently of Moses, to whom are accredited the opening chapters of Genesis, the first of which written with a certain cadence and in some sort of rhythm, would I suppose be correctly termed a psalm. Provided these statements be accurate, for I am no adept at the cuneiform, it would seem as if there has always existed a hazy idea concerning tailed men, among our fellow creatures; and we might easily imagine such to have had its origin among the picture-writers of remote antiquity in some actual tradition, although we are only able to reason from affinity and analogy. On the Culdee monuments, hunting the elephant is also now and again depicted, but I question if the said elephants could be proved mammoths or mastodons, as I do not think that they are "hairy" beasts; though at the same time they certainly harmonise well with the tailed men, and their huntsmen have Celtic targets, and the character of the monuments themselves is very evidently not Christian, but in harmony with those previously noticed; and the whole is vividly suggestive of the age of Saturn, "Pan's blameless reign, and patriarchal days."—*A. H. Swinton.*

DEPRAVED APPETITES.—No doubt the cat mentioned by A. Verinder (p. 45) is suffering from worms; when such is the case these animals (and dogs also) acquire a depraved appetite, seemingly to assuage the constant sense of gnawing at the stomach caused by the presence of the parasites. I have seen dogs eat chrysanthemum leaves, cinders, and other equally absurd delicacies (?). A few doses of areca nut would soon solve the question, however, as much as will lie on a sixpence would be the dose for a full-grown cat. I would advise A. Verinder to give it a trial.—*W. Finch, jun., Nottingham.*

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.

T. H. B.—Any of Murby's excellent series of cheap scientific manuals would meet your requirements. Longmans' have published a still better set of works at 4*s*. 6*d*. each. W. Collins & Sons, Glasgow, have also issued a capital and cheap library of books on the subjects you name.

MISS S. SMITH.—The so-called Australian "opossum" belongs to the same order (Marsupialia) as the American animals bearing the same popular name. The zoological name of the common Australian kind is *Phalangista vulpina*. Eggs both of the echidna and platypus are not common, and the Editor of SCIENCE-GOSSIP would be glad to be supplied with one.

A. R. BANKARTE.—Apply to Mr. Geo. Morton, F.G.S., Geological Society, Liverpool, who a few years ago published a handy little manual of the carboniferous limestone of North Wales, with maps, photographs, lists and localities for fossils, &c.

G. W.—You might apply to any of the dealers in microscopic materials who advertise in the pages of SCIENCE-GOSSIP.

C. G.—You had better make Havre your head-quarters. If you can, get Quatrefages' "Rambles of a Naturalist" on the coasts of Normandy (2 vols.) translated.

C. C.—See McAlpine's "Zoological Atlas."

F. A. HUTTON.—A General Index to the first twelve vols. of SCIENCE-GOSSIP was published at the close of 1876, price 8*d*. Apply to our publishers, Messrs. Chatto & Windus. Perhaps another Index will be published at the end of the second twelve years.

F. STANLEY.—Mantell's "Geology of Sussex" has some excellent figures of the chalk fossils of that region, with descriptions, &c.

GEO. ALANT.—Huxley's "Physiology" (price 4*s*. 6*d*., Macmillan & Co.) is the best elementary work you can get. Flower's "Osteology" (price 6*s*., Macmillan & Co.) on bones. You could order a student's microscope (from £3 10*s*. to £7) from any of the microscope makers who advertise in our columns.

C. T. W. N. (Sheffield).—We shall be very pleased to receive short notices of the meetings of your society.

EXCHANGES.

WANTED, plants for herbarium from all parts of the world. Correspondence and exchange invited.—Rev. Hilderic Friend, F.L.S., 19 Burlington Place, Carlisle.

DUPLICATES, *Planorbis glaber*, *Helix hispida*, *Helix arbustorum*, *Valvata piscinalis*, &c. Desiderata, *Planorbis nitidus*, *Sphærium ovale*, *Pisidium roseum*, *Succinea oblonga*, or any slugs' shells.—John Clegg, 5 Derby Street, Millwood, Todmorden.

I SHOULD be glad to correspond with a collector in the north of Scotland with a view to exchanging the eggs of our midland birds for those of the birds of his neighbourhood.—K. D., Cofton Parsonage, Redditch.

WANTED, good 5 × 4 or ½-plate portable camera, swing back, changing slide; lens must be good. Exchange, S. Kent's "Infusoria" (cost £3 3*s*.), or other works.—H., 73 Clarence Road, Clapton, N.E.

EXCHANGE, land and freshwater shells for fossils of any formation.—F. Hodgson, Laywood, Cornholme, near Todmorden.

WHAT offers for vols. 12 and 2 of "Industries," unbound? Wanted, Newman's "British Moths," or Darwin's "Formation of Vegetable Mould by Worms," and "Fertilization of Orchids by Insects," or books on pond life.—John E. Nowers, 71 Branstone Road, Burton-on-Trent.

EATON'S monograph of "Recent Ephemeridæ," parts 3 and 4, with 18 plates; also Day's "Breeding of Salmon"—Linnean Society—in exchange for good micro slides, chiefly botanical. —Beta, Castle House, Malvern.

WANTED, SCIENCE-GOSSIP, vol. ii. (Nos. 13-24, inclusive), either bound or in parts, latter preferred. Offered, mounted slides for polariscope. W. Wise, Chemist, Launceston.

DUPLICATE fossils from various formations, localities guaranteed, own collecting. Micro object slides (diatoms, zoophytes, &c.) wanted in exchange.—P. Thompson, 19 Guerin Street, Bow, London.

P. glaber in exchange for any other land and freshwater shells.—T. Ingham, 3 Railway Street, Blackpool.

WANTED, foreign or English shells, star-fish, echini, birds' eggs, corals, &c.—Fredk. Stanley, Cliftonville, Margate.

GESENIUS'S "Hebrew Grammar," by Conant (new); Ollivant's "Hebrew History of Joseph," with analysis; Franck's "Méth. de la langue Hébraïque," with vocabularies, and the "Tauchnitz Pocket Hebrew-German Dictionary," in exchange for a good text-book of botany.—R. McCully, Winchester Road, Romsey, Hants.

"OBSERVATIONS on the Uraniidæ," a family of Lepidopterous insects, with a synopsis of the family, and a monograph of Coronidia, one of the genera of which it is composed. Coloured plates. By J. O. Westwood, M.A., F.L.S.; Part 12 of "Transactions of the Zoological Society of London," quite clean. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

WANTED, a few leaves of berberis infested with *Œcidium berberidis* (stage of *Puccinia graminis*); will give good micro slide or other micro material.—J. C., 23 Roland Road, Lozells, Birmingham.

MURPHY'S "Tacitus," Murphy's "Sallust," Hume's "Essays," Byron's "Life and Journals," Smith's "Thucydides," D'Aubigné's "History of the Reformation," Guizot's "English Revolution," and Kirke White's "Remains," in exchange for fossils from any strata, but chiefly from carboniferous.—Dr. Tooner, Clifton Avenue, Levenshulme, Manchester.

WANTED, Howitt's "Flora of Nottinghamshire;" will give good value.—H. Fisher, Newark, Notts.

WANTED, to exchange British for North or South American plants. I have about 700 species which are not native in North America. Printed list sent on receipt of address.—H. Fisher, 26 Stodman Street, Newark, Notts.

WANTED, boxes for slides—not rack-work—in exchange for SCIENCE-GOSSIP for three years.—Miss Jelly, Hatchlands, Redhill, Surrey.

WANTED, live spawn of frogs and newts; good exchange given in micro slides, &c.—H. P., 103 Camden Street, London, N.W.

WANTED, pocket microscope lamp; also best quality 4-inch objective. Good exchange given in micro slides, &c.—H. P., 103, Camden Street, London, N.W.

ENGRAVINGS of varieties of British Unios and Anodons, in exchange for Continental, land or freshwater shells, or varieties of British Helices.—Geo. Roberts, Lofthouse, Wakefield.

DUPLICATES:—*Venus verrucosa*, *Trochus halinosa*, Sulcosa, Picturata, *Cantharus subruginosa*, *Nassa variabilis*, *Columbella rustica*. Desiderata, other marine species new to collection.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

FINE foreign specimens of Helix, Clausilia, Patella, Mitrella, Cerithium, Trochus, Zizyphinus, Unio, *Planorbis physa*, and many others, offered for specimens not in collection. Correspondence invited from all parts of the world.—J. T. T. Reed, Ryhope, Sunderland.

Clausilia Rolphii and *Plan. glaber*, in exchange for any of the vertigos or slug shells.—Sam Clough, 20 Abingdon Street, Blackpool.

A COLLECTION of British land and freshwater shells—over 70 different sorts. Particulars sent on application.—Miss M. P. Fitzgerald, North Hall, Preston, Candover, Basingstoke.

WANTED, fossils and minerals in exchange for general curiosities (natural history specimens, &c.). List sent.—A. S. Richardson, 39 Edithna Street, Stockwell, London, S.W.

Planorbis glaber in exchange for other British or foreign land and freshwater shells, or marine and butterflies.—W. Dean, 50 Canning Street, Stoneyholme, Burnley, Lancs.

P. glaber (from the only Lancashire locality), *V. piscinalis*, *H. arbustorum*, *H. nemoralis*, and others, in exchange for books or shells.—Joe Bates, 20 Lord Street, Burnley.

WANTED, books on Practical Biology (Huxley's excepted). Offered, Lyell's "Students' Elements of Geology" (1885, new), and Newsholme's "Hygiene." Wanted, also, land and freshwater shells in exchange for *H. cantiana* and *H. virgata* (fine specimens.)—Chas. A. Whatmore, Ranelagh Road, Wolverhampton.

WANTED, clay from a fossiliferous bed of the gault; ditto from fossiliferous marine bed of the London clay. Chalk marl from the Kentish beds, and material from any marine strata also wanted. Good exchange.—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

WANTED, foraminiferous material of any description, except sponge sand. Good exchange in like material, or in named specimens or micro slides.—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

SIX species of foraminifera, chiefly foreign, selected and ready for mounting, in return for one good mounted slide. All specimens named and localised. Mutual approval necessary. Write first, giving name of slide offered, to—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

WANTED, *Limnæa stagnalis* from Ireland, Scotland, Wales, and the Continent, in exchange for either of the following:—*Helix pisana*, *Bulimus montanus*, *B. acutus*, *Cochlicopa tridens*, and *Pupa secale*.—J. Madison, 167 Bradford Street, Birmingham.

WANTED, properly named Liassic fossils, in exchange for fossils, shells, &c.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

Planorbis glaber and others in exchange for land and freshwater shells or fossils.—A. Walton, 44 Canning Street, Burnley.

WANTED, uncleaned marine diatomaceous deposits, particularly Cambridge Estate, Barbadoes, Hungarian (various), Limbirsk, London clay, Monterey, &c. Will give good exchange. —E. B. L. Brayley, F.R.M.S., Rockdeane, Hughenden Road, Clifton, Bristol.

WHAT offers for a collection of about 100 British mosses, well mounted and named?—C. H. Waddell, Kendal.

OFFERED, back numbers of "Grevillea," "Scottish Naturalist," "Journal of Botany," and "Popular Science Review." —C. H. Waddell, Kendal.

WANTED, seeds and capsules of British plants, in exchange for land and freshwater shells, books, &c.—P., 80 Leathwaite Road, Clapham Common, S.W.

WHAT offers for Muspratt's "Chemistry as Applied and Relating to the Arts and Manufactures," 7-11, 14-21, 23-44—thirty-five parts in all?—A. E. Fasnacht, Clayton, Manchester.

WANTED, dragonflies, echinoderms, crustaceans, and marine shells; lepidoptera and natural history books given in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

OFFERED, "Entomologist," vol. 19, also several odd numbers of vols. 18 and 20, and "Entomologists' Monthly Magazine." Wanted, dragonflies.—W. Harcourt Bath, Ladywood, Birmingham.

MICRO slides (over 300), in exchange for diatom slides, polar. crystals, or offers.—A. Downes, 5 Royal Park Road, Clifton, Bristol.

WANTED, British bird skins. Offered, other British and foreign bird skins, or bird books.—J. H. K., 18 Church Street, Commercial Street, London, E.

WANTED, to form party of six to take in and circulate "The Zoologist."—J. H. K., 18 Church Street, Commercial Street, London, E.

A LARGE number of American birds' eggs in exchange for British.—W. Wells-Bladen, Stone, Staffordshire.

BOOKS, ETC., RECEIVED.

"Old and New Astronomy," by R. A. Proctor, Part I. (Longmans').—"The Flora of West Yorkshire," by F. Arnold Lees (London: Lovell Reeve).—"Medical Annual, 1888" (Bristol: Wright).—"Birds of Herefordshire," by Dr. Bull (London: Hamilton, Adams & Co.).—"Shell Collectors' Handbook for the Field," by Dr. J. W. Williams (London: Roper & Drowley).—"The Microscope."—"Journal of Conchology."—"Book Chat."—"Scribner's Monthly."—"The Amateur Photographer."—"The Garner."—"The Naturalist." —"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News."—"Wesley Naturalist."—"Naturalists' Monthly."—"La Science Illustrée."

COMMUNICATIONS RECEIVED UP TO THE 14TH ULT. FROM: W. R. N.—C. C.—G. L.—P. S. T.—W. H. J.—A. J. H. C.—J. E. N.—K. A. D.—J. D. H.—T. D. A. C.—C. E. S.—F. W. W.—F. H.—B. T.—F. L.—G. T.—G. F., jun.—B. B. W.—J. W. W.—J. S.—G. W. B.—J. A., jun.—F. B. C.—J. H. J.—R. McC.—J. A. T.—J. C.—F. S.—A. S.—G. E. E., jun.—S. P. P.—C. L.—C. P.—P. T.—W. W.—E. C. J.—H. F.—T. D. A. C.—W. G.—F. W. A.—J. C.—Rev. H. F.—H. W. P.—A. J. H. C.—G. R.—J. T. T. R.—G. W.—S. M. P.—W. J. J., jun.—S. C.—T. J.—F. H. A.—W. D.—A. S. R.—M. P. F. G.—J. B.—A. G. T.—S. G. McI.—S. B.—W. J.—S. H.—J. C.—N. F. L.—C. A. W.—J. E. K.—A. E. F.—A. S.—A. E.—J. M.—J. H.—A. W.—G. B.—A. R. B.—E. B. L. B.—J. D. H.—A. D.—B. T.—C. H. W.—W. J. H.—W. H. B.—J. H. K.—W. W. B.—W. A. C.—J. S. H.—S. P. B.—&c.

ON LAND SUBSIDENCES.

By Dr. CRESPI.

EVERY one has heard of the land subsidences in the salt districts of Cheshire, where lakes form and houses threaten to fall in a manner that rather shakes the nerves of the timid. But every one is not aware that Droitwich, in Worcestershire, is more slowly but not the less surely sinking into the ground, or rather I ought to say, that parallel to certain lines the land is sinking, and in this way much destruction of property is taking place. Wherever for many years large quantities of minerals are removed from beneath the surface of the ground, there must in time be a settling of the superficial strata, and this settling is slower when the quantities of material removed are small and from a great depth, while, when the amount removed is large and near the surface, the subsidence is far more rapid and destructive. Near Dudley, the educated eye sees on every side signs of land subsidence, and in many other parts of the Black Country houses are shored up, walls are cracked, and a general though unequal sinking is obviously taking place. There is, however, nothing unusual in the settling at Droitwich, nor is the sinking on a very alarming scale, and, so far, it has not been marked by terrible catastrophes, only one house having totally collapsed and in that instance no lives were lost.

Droitwich is not a prepossessing place: it is not tastefully built, and is somewhat dingy; the houses are mostly shabby, and the shops small, and there is little to distinguish it from a host of other fourth-rate manufacturing towns which chiefly strike the visitor by their dulness, smoke, and dirt. The country round the town is, however, extremely pretty and very fertile, and there is no difficulty in getting away for a few hours to many of the prettiest and most delightful spots in England. But the fame of Droitwich, such as it is, is connected with its brine, and were it not for inexhaustible supplies of the purest and strongest brine in the world—the residents say the purest and the best found anywhere—no one twenty miles off would have heard of the grimy little town, through which the Midland expresses tear without stopping on their way from Cheltenham to Birmingham.

To the Romans the town was well known, or rather it is to the Romans that it owes its foundation: that great, wise, and enlightened people discovered the properties of its brine springs, and with characteristic energy set to work to extract salt from the water that at that time welled up to the surface in inexhaustible streams. As the brine is nearly saturated and contains two-fifths of its weight of salt, and only requires to be evaporated to yield a pure residuum of salt, the process of salt extraction (for it is not fair to call it salt manufacture) is easy and simple.

At present over 115,000 tons of salt are extracted every year, and allowing that four times as much brine is pumped up in the course of the year, half a million tons are removed from a depth of 200 feet or thereabouts. Whether the brine comes from deep reservoirs or from salt beds traversed by subterranean streams—the explanation locally hazarded—is immaterial: the fact remains, that the removal of such vast quantities must in time lead to decided sinking of the surface; and as this sinking or rather these areas of subsidence are of irregular size and do not include the whole town, although they in some directions extend far beyond its boundaries, the visitor is prepared to learn that, in twenty years, the sinking has reached 19 feet. I do not vouch for the accuracy of this calculation.

On leaving the station and making our way into

the town, we notice that the unfavourable impression, which a first glimpse of the place makes, is corrected to some extent by a closer inspection, and, moreover, near the station there are dozens of new houses, showing that the sinking is not so marked just there, although possibly the great convenience of being close to the station has outweighed other considerations. On reaching the middle of Droitwich, the visitor is struck by finding that some houses of considerable antiquity still remain—strong and habitable houses evidently going back a couple of centuries or more. At the top of High Street is a church of some size and age, but no longer used, being considered unsafe; and just outside the town, overhanging the railway, there is another church, which, though still used, has its tower curiously out of the perpendicular. At one time High Street had a gradual descent into Queen Street, and water readily flowed all the way down; now there has been a decided sinking half-way down the former, and water flows from both ends of High Street towards the middle. Queen Street struck me as far more curious; here the sinking has been very decided; indeed some residents favoured me with reports that made me quite fear, that I should some morning hear that half Droitwich had fallen in. In Queen Street there used to be a chapel, which became so unsafe that it had to be taken down and rebuilt nearer the station. Dr. William Parker Bainbrigge, a most courteous and well-informed local practitioner, permitted me to inspect his new house in Queen Street. I entered, going down from the street into the hall, but, strange to say, when the learned physician built that house, four years ago, it was on a level with, if not actually above, the pavement. Along the Worcester Road, a few hundred yards from the middle of Queen Street, two walls are noticed skirting the road, one on each side, and now the west wall presents a striking appearance: the eye can trace the different stages of building, in other words the wall has been built up as occasion required to keep it level, on the east side the wall has sunk to the level of the ground, although my informant, Dr. Bainbrigge, told me that at one time he could hardly look over that high wall into the street. Close to Queen Street again, there are yards with the roofs of the houses only just showing above the ground, all else having vanished. Much of the town is only kept from falling by the careful shoring up that has been raised to a science, and to which many houses owe their continued existence. Of course new houses are seldom built in the more dangerous parts of the town, and that continuous improvement, which has transformed many shabby fourth-rate old towns into quite presentable places with good shops and handsome villas, is impossible here while the depreciation of house property is considerable. Still it is only fair to mention, that there are some excellent baths and hotels in good condition, indeed one range of handsome baths is quite new, so that local enterprise is not dead, and since my last visit still more extensive building has been going on.

The reader will perhaps ask how, if the land is sinking in certain areas, the houses are sinking more rapidly than the ground around them. That is, I need hardly explain, not the case; the houses and the land are sinking, and the houses on opposite sides of the lines of greatest subsidence fall towards those lines. But the roads and yards have to be levelled up, and thus it comes about that the houses seem to be sinking into the ground, while in reality it is the raising of the roadways and yards that leads to some of the most curious effects which I have described.

Droitwich, in addition to its antiquity, land subsidence, and pure salt, has acquired a well-deserved reputation as a health resort; and large numbers of sufferers from gout and rheumatism are flocking to the town to try its baths. The benefit which many of these poor creatures derive is remarkable. When, however, will people learn that it is better to keep illness at a distance than to be temporarily relieved? when will they remember that, though a visit to the Droitwich Brine Baths may restore mobility to the stiffened joint and comfort to life, it is most important after leaving the health-giving waters of the Roman Salinæ and the Mediæval Wick, to live wisely, temperately and naturally, avoiding luxury and self-indulgence, and thus succeeding in keeping illness at a distance? Greater purity of living would prevent half the sickness that casts a deep shadow over the lives of the middle-aged and elderly, and with strict abstemiousness there would be far less gout, rheumatism, and dyspepsia, and consequently less need for Droitwich.

Wimborne.

GEOLOGICAL PROGRESS DURING THE LAST FIFTY YEARS.

THE following is an abstract of an address recently delivered by Dr. J. E. Taylor before the Ipswich Scientific Society:—

Dr. Taylor commenced with what he called the stratigraphical part of the subject, that is, the advance which had been made in our knowledge of the strata of the earth's crust. Fifty years ago, he said, our knowledge of the earth's strata was confined to about half of what it is now, and that knowledge very limited. Indeed, just a few years before, Professor Sedgwick had given the name of Cambrian to the rocks composing North Wales and Cumberland, and Sir Roderick Murchison was then engaged in the investigation of the Silurian rocks; in 1837 Dean Buckland published his famous Bridgwater Treatise, which, perhaps, did more to redeem geology in the eyes of prejudiced religious people, from its supposed atheistic associations, than any work that was ever

published. At that time, said Dr. Taylor, both the Cambrian and Silurian rock formations—two of the thickest in this country—were very imperfectly understood. There was no Devonian formation as it now stands, no Permian formation, and the Neocomian, which comes between the chalk and part of the Wealden, had not been recognised. There was a great break between the close of the chalk period and the commencement of the Tertiary period, which has since been filled up in part by the discovery in Denmark of deposits of intervening age, and still more so by certain thick beds in the Western States of America, Dacota for instance. In 1837 the great Tertiary system was practically waste ground. Lyell was investigating it, and his subsequent divisions of it, based upon the relative percentages of recent shells which the older and younger strata of this formation contained, were accepted by geologists all over the world, and have been retained ever since. At the period of which he spoke, our Suffolk Red crag was supposed to be the newest formation. The Boulder clays, gravels and sands which mask the northern, midland, and eastern parts of England, were called Diluvian, and even Dean Buckland wrote a paper to prove that these deposits had been left by the Noachian deluge, although he was wise and candid enough to write a recantatory tract afterwards, when he had learned more, to disprove his own former opinion. Subsequently it was found that a special period would have to be provisionally formed to include the same deposits. This is now known as the Great Ice Age, and the marvellous way in which the evidence came in to prove, that we had a glacial epoch at the time when our Suffolk and Norfolk boulder clays were deposited, was detailed at some length by the speaker. Lyell's work on the "Principles of Geology" had but recently appeared in 1837, and was beginning to make headway. Previous to that, it had been imagined that geological formations were the result of catastrophic action, that is to say, of sudden and violent changes, but Lyell demonstrated that the physical changes now in force upon the face of the earth, if given time, would effect all the mighty results with which geology had to deal.

At that time the theories held concerning earthquakes and volcanoes were very different from what they are now. Even the great Humboldt died believing that volcanoes were simply so many blisters on the earth's crust, and he went so far as to think that they were suddenly and violently erupted. Mr. Scrope, Daubigny, and others, were in favour of volcanic mountains being gradually-accumulated growths, and this is now known to be correct. The ideas concerning the interior of the earth were then exceedingly vague, and now seem exceedingly funny. The earth's crust was regarded as much thinner than we now know it to be. The whole of the interior was believed to be molten, whereas we know that it is as rigid as cast steel, so that the idea of a thin crust blistering in the shape of volcanoes and fracturing in the shape of faults was a very easy conception. Geologists at that time lifted up continents and set them down without any difficulty on this easy theory. They brought seas rushing over suddenly-submerged land, with such violence, that it was no wonder they easily interpreted the phenomenon of the drift, with its strange beds of boulders and variously-disposed materials.

Granite was believed at that time to have been the first cooled crust of the earth, whereas it is known that granite in every instance has been formed under exceedingly great rock pressure, never less than that of thirty thousand feet of overlying rocks, and that the reason why it appears at the surface is because those materials had been stripped away by denudation. Between thirty and forty years ago, a few gentlemen commenced a new line of investigation into rocky structures. Dr. Sorby, of Sheffield, cut, sliced, and polished thin sections of granite, and examined them under the microscope. His paper on the results he arrived at, read before the Geological Society in 1862, effected a revolution in geological investigation. From that moment the microscope has been a geological instrument, and the discoveries made by it have been really marvellous.

In 1861, Professor Dawson, of Montreal, announced the existence of vast masses of rock older than the Cambrian formation in the district watered by the River St. Lawrence. These were called Laurentian. He affirmed that certain beds of altered limestone in these rocks had been deposited by a minute organism, which he named Eozoon. This Laurentian series of rocks has since then been found in almost every part of the earth's dry-land crust. It is the core, so to speak, the central part of the known stratified rocks of the earth, although the name of Archean is now generally given to this formation.

Dr. Taylor then took up the second part of his subject, which dealt with the fossil remains in the rocks. The idea, fifty years ago, was that each geological formation represented a special creation and a special extinction. Creation was then believed to be sudden, after the old idea, and extinction to be equally brief. This idea maintained its ground up to a quarter of a century ago in some geological manuals. Darwin's works first started the idea of a continuous stream of life upon the globe, which idea hitherto had been checked by the belief that, at the close of the Primary epoch, there had been a great break in the life of the world, and that a similar break occurred at the close of the Secondary epoch. But the fact, that in other parts of the world deposits had been discovered containing fossils which bracketed together and filled up these gulfs, not only met the difficulty, but established for ever the fact, that there had been a continuous stream of life upon our planet. The fossil remains known in the earth's crust fifty years ago were not a twentieth part of those known to-day.

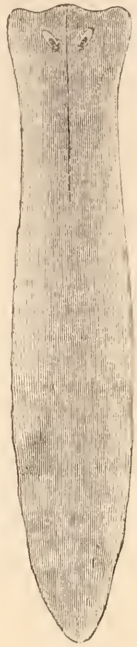
The remarkable thing about many of these fossils, as a rule, was that they were "missing links." Many of them came to fill in the gaps which existed in the living scale of animal and vegetable life. Thus the Dipnoids, which are so abundant in the Old Red sandstone or Devonian formation, are a link between the fishes and the amphibians. The Dinotheria, reptiles which existed during the Oolitic period, and many of which attained a huge size in America and Europe, were remarkable for their bird-like affinities. This bird-like relationship, which is now only represented in existing reptiles by a few useless bones, was then still further intensified by the discovery of a feathered reptile, or a reptile which could fly. The first mammals, or warm-blooded terrestrial animals, that appeared early in the Secondary period, were of the same kind as those which now exist on the Australian Continent. Only one or two species were known to have existed at the beginning of the Secondary period, but by the close of the period about a score have since been discovered adapted to various conditions of life. It was not till the Tertiary period that true placental mammals—animals which bring forth their young alive—are known to have existed. About this time the grasses, the earliest of herbaceous flowering plants introduced on the face of the earth, had become "social," or acquired the habit of growing together, and this seems to have affected the mammalian life of the world in no small degree. The first known placental mammals were herbivorous. Their types were very generalised, that is to say, they possessed characters which have since then been split up into half-a-dozen genera, and perhaps into several families. Speaking of the generalisation of life, Dr. Taylor said it was the same with the earliest insects that appeared in the world. They belonged to generalised types, or, in other words, possessed characters which were now severally distributed to leading families of insects.

The lecturer then contrasted the onward progress of the mammalian life during the Tertiary period, illustrating his remarks by specimens taken from the Museum collection, which he said occupied no small or unimportant space in the demonstration of the progressive life of the world. After having pointed out our increased knowledge of the fossil vegetable life, due largely to microscopic investigation of fossil vegetable tissues, the lecturer concluded amid great applause.

VOLVOX GLOBATOR.—I read in Pritchard's "Natural History of Animalcules," 1834, that infusions of hemp-seed and Tremella are said to abound with specimens of *Volvox globator*. What is Tremella? And is the assertion supported by experimental fact? I have tried hemp-seed and failed.—*R. H. Nisbett Brown.*

NOTES ON TURBELLARIA.

PERHAPS a word from this side of the Atlantic, may not be uninteresting to your readers. Not far from my house is a half-stagnant pool covered by lemna and shaded by alders all the summer long. In this pool, a "happy hunting ground" of mine, I have found in numbers quite abundant, a Turbellarian worm, which until recently I supposed to be *Planaria torva*. While manœuvring one of them, trying to free from it an external parasite, for the better study of the parasite, I chanced to crush the worm. Immediately there issued from the body a number of tube-like forms, each of which moved about the slide, elongating and contracting itself, and keeping



A

Fig. 39.—Worm as usually seen crawling.

B

Fig. 40.—Worm under compression, showing proboscis (D) in position.

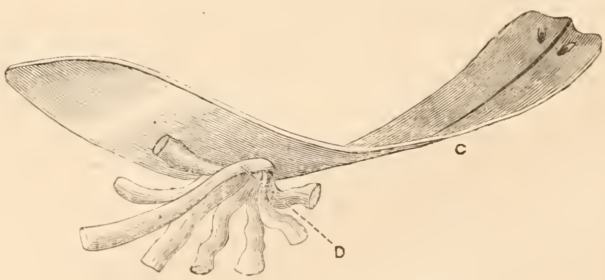


Fig. 41.—Proboscis exserted.

up perpetually a gasping swallowing movement, during which I could see portions of the worm's viscera pass completely through.

A scientific friend to whom I sent specimens with drawings, after much study and searching, found that the worm was probably a form described by Leidy in the "Proceedings of the Academy of Natural Sciences," Philadelphia, in 1848, under the

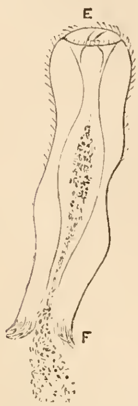


Fig. 42.—Proboscis as disrupted from body; (E) being free end.

Fig. 43.—(F) free end.

name of *Phogocata gracilis*, and that the tubes (so-called), varying in number as I have found them from four to twenty-two (Leidy says twenty-three in the full-grown animal) were the proboscides of the animal. By placing the worm in a compressorium and subjecting it to pressure, these proboscides may be quite well seen in the body cavity writhing, extending and contracting themselves, with a ceaseless motion. I enclose rough sketches of the creature, and of the proboscides as they appear when separated from the body. They may interest you. I may say that the infusorial parasites, which are found quite plentifully upon this species of worm, are identified as *Urceolaria mitra*, and it is said to be the first time they have been seen in this country.

H. E. VALENTINE.

Boston, Mass. U.S.A.

"SACCHARINE"—A REPLY.

THE March number of SCIENCE-GOSSIP contains an interesting, but withal somewhat amusing, chapter by Dr. Alfred Crespi, on "Benzoylsulphonicionide"—the new and marvellous sweetening agent which recent research has been successful in producing from that most unlikely source—coal tar. The article is interesting, because of the scientific details it gives, and because it draws public attention to one more of those wonderful discoveries by which, for the past twenty years, scientists have been steadily increasing their usefulness to, and earning the gratitude of, every section of the community. It is amusing only when the writer comes to the prosy question of commercial utility; then no other simile suits the story so well as a game of skittles, the varying probable uses of the production being trotted out only to be bowled over again and knocked down by the apparently somewhat self-doubled contrary arguments; and it occurred to me that a few words, from a manufacturer's point of view, might not be unacceptable to general readers.

It is usually understood to be an easy task to prophesy after an event has taken place, and, having donned the prophet's mantle, Dr. Crespi peeps into the future (?), and tells us that "probably for commercial and domestic purposes saccharine will soon come into common use in the form of an alkaline powder." But this is exactly what has already happened: a large firm of London wholesale grocers are the agents for the U. K.; and in many of our leading retail shops little packets, containing a small bottle with a tiny scoop measure, are being offered to a discriminating British public at 2*s.* 6*d.* each.

The essayist considered it to be "reassuring to be told saccharine will not drive cane or beet sugar from the field"; he does not venture upon giving any reason for this comforting statement, but endeavours to evolve "three great fields" of usefulness, the third and least extensive being the only one that it is at all likely to be of much service in. Sugar is strong poison to some poor sufferers, and to these the boon offered is almost beyond price; were it alone for their sake every sympathetic man would hail its introduction with joy. They are enabled to receive that for which nature craves without detriment to their physical conditions.

The second, that of covering the taste of sickly drugs, is so ably disposed of by the Doctor himself that I need not say one word upon the point, but will at once address myself to the first, which is the largest of the three fields, and which contains the greatest fallacy, viz. Its applicability to manufactured goods, with special reference to the confectionery trade; and it may as well be stated at once very broadly that, except for the flavouring of liquids, etc., in which bulk is not a point at issue, or for the sweetening of culinary preparations requisite for invalids, *it is of no practical value to the manufacturer* unless he got it almost entirely free of cost, while at present its cost is about equal to that of good sugar.

After having put certain ingredients together and cooked them in the necessary fashion, the first consideration with the maker is to know what weight he has left, sugar as well as most other goods suffering a loss by evaporation when at boiling-point; this, however, due care reduces to a known quantity. Let me give an illustration: if it were desired to produce about one hundredweight of cake, 84 lbs. to be the several component parts, and 28 lbs. of sugar to be added, the total cost of material being, say, 30*s.*, and the turnout, after baking, would be, roughly

speaking, some 105 lbs. This loss would therefore increase the cost of material by about 2*s.* per hundredweight; but suppose the maker had used the relative number of ounces of saccharine as his sweetening agent instead of sugar, his cake would only weigh about 81 lbs. instead of 105 lbs., and his cost, instead of being about 32*s.*, would be nearly 41*s.* 6*d.* per hundredweight, and for this reason it would be outside the pale of commercial utility. It will be readily seen that this would apply with even greater force to sweetmeats and jam, in which the proportion of sugar used is much larger than in the case suggested. How then can it be expected to "give an impetus to the sweetmeat trade"?

There are two peculiarities of saccharine which are worthy of notice, its distinctive flavour, and its antiseptic properties. The writer prepared two equal quantities of apple jam, the one sweetened with sugar, the other with its relative quantity of saccharine; the former was jam in the proper sense of the word: a due blending in flavour of the fruit and sugar, but the latter was not so—the sour fruit and the sweet saccharine were both present, but retained their distinctive flavours. There was no blending, but the sour passed away, leaving a sweetness behind that would cloy if used even in only ordinary portions. These trials were made some months ago, and although the sample prepared with saccharine has been submitted to the most trying tests, there has been an utter absence of any fermentation such as would have been produced either by the sugar or the fruit if submitted to the same conditions. It therefore takes rank very high as a powerful preservative, and except for the reasons indicated respecting its bulk (which is insurmountable), it would on this account alone form a formidable rival to sugar, and this would be a source of deep regret, if it could be considered as possible, for few would agree with Dr. Crespi in saying, "unfortunately it must not be forgotten that sugar is a cheap and valuable food." I would rather say it is a most fortunate fact that no inducement exists leading manufacturers to replace an article which enters so largely into consumption by one which "is not changed in its passage through the body." As a professional man, Dr. Crespi may think it is right that "we range with science glorying in the time" when progress does not "halt on palsied feet," but one may ask him to consider the results of such an innovation—such a revolution as he would picture even possible: the tremendous loss of capital consequent upon the transfer of the place of manufacture from the factory to the laboratory, and the cessation of the wage-earning power from the grower of the beet or cane to the producers of the finished article. Or, dismissing this as only a part of the incidence of trade, the fearful loss of a nutritive food supply which would be produced, more especially to the poor; for statistics show that, as price has gone down, the consumption per head of the population has considerably increased, and therefore it follows that if "the joy of youth and the solace of old age" is taken from manufactured products and a chemical introduced instead, the poor would be the first to suffer, and this (I take it) is the last end and aim of true scientific research.

G. H. Wicks.

Bristol.

THE BEE AND THE DEVELOPMENT OF HONEY IN FLOWERS.

By G. W. Bulman, M.A.

THE whole theory of the development of honey, by the selective action of bees, &c., hinges on the supposition, that those flowers secreting it obtain some advantage in the struggle for existence. And the advantage is supposed to arise thus: When bees fly from flower to flower gathering honey, they carry pollen grains from one to another. It has been proved—in the case of certain flowers—that the offspring from a cross are more numerous and vigorous than those from self-fertilised flowers. When a flower secretes honey the bees visit it, and fertilise it with pollen from another, it produces more numerous, and vigorous offspring than the honeyless ones. Thus in time the honey-bearers become a majority.

"Those individual flowers which had the largest glands or nectaries, and which excreted most nectar, would be oftenest visited by insects, and would be oftenest crossed; and so, in the long-run, would gain the upper hand."

So says Darwin, and so his followers continue to believe. The statement seems plausible, and it may be we see in imagination the race of flowers secreting more and more honey in obedience to the selective action of the bee or other insect.

A little reflection, however, and a careful consideration of the facts of the case, quickly dispel the illusion. It does not require the double million magnifying glasses of extra power "to enable us to see, that honeyless flowers, and scanty honey-bearers are just as likely to obtain the advantages of cross-fertilisation as any others."

Consider the case of a race of plants at any stage of the development of honey. There is the same general likeness as we see in any particular species to-day, and the same slight differences. Some secrete no honey, and some comparatively much; some are larger, others are brighter coloured than their companions. Now it seems quite obvious, that a bee visiting a bed of such flowers, will not be guided by any particular outward aspect to the flower with most honey. It will have to go, and examine by close inspection; and will be just as likely to visit the honeyless blossoms as any others. It will scarcely be contended by any one, that a bee flitting over a flower can judge by its outward aspect of the amount of honey therein, without settling on it and examining. The limpid drop of nectar is a thing not

easily seen; and is, moreover, often quite concealed from view in the hidden depths of the flower. There is no evidence that the honey-secreting flowers are distinguished from the rest by any marks which can guide the bee to them. Bees seem to show by their habits, too, that they have no means of ascertaining the presence of honey, save by actual inspection, for several bees will visit the same flower in succession; and the same bee may sometimes be seen to return to the flower it visited a few moments before, after trying others in the interval.

Again bees often visit flowers without any intention of honey gathering.

It is a bright sunshiny day in the early part of February. Winter aconites have spread forth their yellow blooms, and offer their store of honey to the early bees. A few of the industrious insects are abroad and hard at work. They are rifling the yellow blooms, but not of nectar. Pollen is the object of their search, and the circlet of tiny cornucopias surrounding the stamens offer their sweet drops in vain. On such occasions it matters not to the bee whether a blossom secretes little honey or much, those with the greatest store will obtain no advantage. Such being the facts, we must, I think, admit that the individuals in the race of flowers which secrete much honey are no more likely to obtain the benefits of cross-fertilisation than those producing little or none. And with this admission the whole theory falls to the ground. The selective action of the bee has not even a theoretical influence as a producer of honey.

OBSERVATIONS UPON THE TURTLE, AND THEIR ARTIFICIAL PROPAGATION.

By W. August Carter, of the National Fish Culture Association.

During the Colonial and Indian Exhibition specimens of turtle from Western India were shown in the aquarium, sometimes numbering as many as fifty simultaneously. I made a series of observations upon them at the time, and propose to record the result of some of them here.

In the first place, I noticed that the turtle is a somnolent creature, spending a large amount of time in sleep, or repose. They rest at intervals throughout the day, and usually sleep in the early morning, becoming abnormally active at night. When asleep, they lie upon the bottom of their habitat with their heads downwards and eyes closed. At such periods they are not easily disturbed, and appear oblivious to all outward influences brought to bear through the molestation of their congeners. The weight of turtles is considerable, and precludes them from locomoting perpetually in the water; indeed, it seems curious that such awkward creatures have the power to move as rapidly and easily as they do. As a rule, when swimming, they keep near the surface, in order to gulp in air readily, which they do by stretching forth their head from the water.

Upon land they are helpless creatures, being almost as powerless as the seal under similar circumstances, although there is a decided difference in the formation of their organs. Turtles are able to capture their prey with great agility, being provided with a long neck, which they extend to a considerable degree when seizing it. The head moves quite freely, as well as the fins and tail, which are all quite independent of the shell. Unlike the tortoise, the turtle's head is non-retractile. The former, upon the approach of danger, withdraws its head and limbs, presenting to the aggressor an impervious exterior, proof against the stoutest foe. The house which the turtle carries, however, is a mere shield for the back, and does not, as in the case of a land-tortoise, form a complete covering to the animal. The shell of the former is very light, enabling it thereby to adapt itself to an aquatic existence.

From what I have seen I have arrived at the conclusion, that the turtle is a spiteful, pugnacious, reptile. Extreme examples of this are to be found in young turtles rather than in their elders, as I have frequently seen the former attack the latter, and meet with only a small amount of retaliation. The appearance of two turtles undergoing a pugilistic encounter is highly comical; their utter helplessness rendering the contest all the more exciting. The quarrel sometimes arises from a disputed right of occupying a certain position; when one turtle will jostle another until it retaliates by inflicting blows with its fins upon the head of its foe, which appears to be the most vulnerable part of turtles. Then follow a succession of charges, when they bite and gnaw at one another in the encounter until the vanquished one retires to a remote corner, but only to be attacked again by its enraged congener.

In regard to the artificial reproduction of turtle, there is no doubt that the ova could be hatched if subjected to proper treatment. In their natural state they are deposited by the mother chelonian in the sand, about two feet deep, where they become incubated through the action of the sun. In breeding them artificially nature must be closely imitated, and every detail studied, to ensure success. According to the precepts of nature, I venture to think the following plan might be advantageously adopted. Place the eggs in sand, heated to a normal temperature of 70° from underneath, by the means of hot water pipes. This heat should be perpetually maintained throughout the twenty-four hours. During the day heat should also be concentrated from without, bringing the temperature up to 100°, which could be attained by enclosing the incubating apparatus, taking care to admit a certain amount of air. The sand should be slightly moistened by allowing a small quantity of vapour to descend upon the ova at night-time.

When the turtles break from their shells their first impulse is to seek the water, therefore provision should be made for this, taking care that the water has a temperature of at least 100°. When the ova are shed they are soft, but afterwards become hard, and the progress of formation within can be detected by passing the hand over the eggs, which, at the end of a month, furnish evidences of life. I am inclined to think that, if a suitable incubator was supplied, and the natural conditions of the shelly creatures carefully provided for, they might be reared in this

Fig. 44.—Catching Turtles (from an old print).

country artificially. It would, I fear, be impossible to domesticate these tropical denizens to our shores, but they might be cultivated in the way described. The propagation of the turtle is a most desirable thing from a commercial point of view. It is idle to expect them to enter largely into our list of dietaries, but their numbers might be considerably strengthened by proper and systematic measures being adopted abroad.

Turtle soup has become such a popular institution that there would be hosts of individuals ready to applaud and support any undertaking having for its object the extensive culture of turtles in Western India and other tropical parts. Their scarcity is due, in a great measure, to the destruction of ova, and their conversion into food, the eggs being highly nutritious.

This wholesale plunder ought to be vetoed by legislative restrictions, more especially on account of their feeble power of reproduction as compared with their finny congeners. Turtles shed a very few ova at one time during the breeding season, but they hatch out with a greater amount of certainty than the eggs of more prolific breeders. The growth of young turtles is rapid. Immediately they emerge from the ova they seem instinctively to dread the dangers surrounding the first stage of their existence, when their path is beset by hosts of predacious birds which swoop down upon the tiny chelonians immediately they burst from their shell. Their flight to the water, however, to avoid their aerial foes is a remarkable instance of a powerful and discerning instinct, being accomplished with a desperate rapidity inspired by a keen sense of dread.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Sugar Refining by Electricity.—"Electrician" tells us that this is to be carried out by a company in New York, "The Electric Sugar Refining Company," which expects to convert a ton of raw sugar in two hours into perfectly hard white sugar at a cost of 3*s.* 2*d.* per ton, and intends to turn out three thousand barrels daily. This is very wonderful indeed, when we consider the bulk of material involved and the cost of obtaining chemical results by electrolysis. The capital stock of the company is a million of dollars. "Electrician" adds, that "the results in this case will be awaited with a good deal of interest;" scientific interest, I presume, rather than interest on the million of dollars.

Maturing Wines by Electricity.—The same magazine describes more definitely the work of Sig. Mengarini, who is diligently following up the investigations of Blaserna and Carpine in effecting, by the agency of electricity, those delicate and somewhat mysterious changes which in old-fashioned wines were obtained by years of storage, and at very great cost, that of the compound interest of the dormant capital, rental of cellarage, besides loss by evaporation, &c. Wines are very volatile where many tasting tickets are issued.

We are told that in Mengarini's experiments a current of about four amperes was passed through the wine for periods of varying length; that the platinum electrodes become coated or crusted with a deposit which consists chiefly of albuminous matter; that the proportion of alcohol is diminished; that some oxidation appears to occur; that the bouquet of the wine was developed almost exactly as by age, and was sensibly increased by every application of the current. The colour was also modified and Sig. Mengarini suspects that the wine is sterilised, and thus rendered incapable of further change.

There is nothing marvellous in all this, especially now we know that a moderate heat, skilfully applied as in "Pasteuring," does the like; the amount of energy demanded is very small in proportion to the commercial value of the result; the actions of oxidation, &c., are similar to those which probably occur in ordinary maturation, and, above all, neither Sig. Mengarini, nor Blaserna, nor Carpine are asking for a million of dollars, nor forming any kind of company or syndicate. This removes a mountain of scepticism.

Museum doings in New Zealand. — Our Colonies are going ahead. The report of the Colonial Museum and Laboratory of New Zealand, tells us, that the attendance of visitors is so large on Sundays that the passages are inconveniently crowded; that 10,708 objects have been added to the collection during the year, and 345 analyses made. This is the 22nd annual report. No thunderbolts have fallen on the Museum building, neither do the statistics of crime indicate any serious demoralisation of the community since the Sunday opening and Sunday crowding has been in operation.

Muzzling Oysters.—We are told that the late Duke of Wellington despised all pills and potions, that when troubled with small ailments he treated himself by simply "putting on the muzzle," abstaining from food until recovery. This recipe has been successfully applied to oysters which grow sick when packed for exportation by opening their shells, and losing the liquid contained therein, after which the air enters and decomposition commences. American observers have discovered that oysters feed only at about the turn of high tide, and that the habit of opening periodically, persists even when they are out of water. Therefore to keep their shells closed they are now muzzled by means of binding wire passed through a hole near the lip of the shell, then twisted with pliers. This, with practice, is done very rapidly, and the muzzled bivalves survive very long journeys.

This muzzling is but a reinvention, original, doubtless, but not new. It has long been practised by our London fishmongers in the barrelling of oysters for transmission to country places, especially in the old coaching days, when barrels of oysters were customary presents to country cousins. The native oysters were carefully laid in the barrels, and each barrel filled above the level of the top. Then the cover was laid on the oysters and the whole thumped down until all were wedged together so closely that opening was impossible. After this the cover was firmly nailed. Experience proved that the oysters thus tightly packed remained fresh for long periods.

The Philosophy of Hanging.—Dr. Gross, of Geneva, has made some curious experiments which threatened to add his name to the list of martyrs to Science. He constructed a noose which firmly compressed both sides of his neck without pressing on the larynx sufficiently to interfere with his breathing. In two minutes he lost consciousness by congestion of the brain, this congestion being due to the compression of the veins which return the blood from the brain. In another experiment he used isolated compression applied simply to these vessels with like result. He tells us that the loss of consciousness was not preceded by either painful or agreeable sensations (the latter have been affirmed to precede death by hanging); the only feeling he experienced was a sense of warmth or burning in the head. He concludes that the drop of the hangman is unnecessary, and that suicide by hanging may be effectual even when the feet of the victim touch the ground.

Within my recollection London sightseers have witnessed two fatal exhibitions of the wretched trick of imitating the work of the hangman. One was at Cremorne Gardens, the victim, if I remember rightly,

was Blackmore, a celebrated performer on both tight and slack rope, who on several occasions suspended himself by the neck and imitated the struggles of a dying man, but at last performed the reality, and was greatly applauded. The other was Sam Scott "the American Diver," who erected a tall mast on Waterloo Bridge, with a boom on which he performed some antics, and then dived from a fearful height into the river. One of his tricks was an imitation of the popular Monday morning Old Bailey performance, which at last he did perfectly.

It was generally supposed that in these cases the rope slipped and compressed the larynx, but Dr. Gross's experiments suggest another explanation. Had the rope slipped as supposed, the athletic expert, finding himself in danger of suffocation, would instantly have grasped the rope and supported the weight of his body as at the conclusion of his ordinary performance, but if he suffered the gradual swooning described by Dr. Gross, he might insensibly pass the stage of strong effort and slowly die.

Police Telegrams.—New York is supplying a lesson in police organisation by adopting a comprehensive system of telegraphic communication between all the police stations of the city. The calls are self-recording, the system of the Herzog Teleseme Company being adopted in preference to the evanescent telephone.

A Hint to Teachers.—All who are practically acquainted with the working of our schools, whether they be what are called "High Schools" or Board Schools, or any other schools, will agree with me in concluding, that the microscope is not doing the work there that it should do as a general educator. Too much of mere books, mere verbiage, mere rote work, and too little of direct knowledge generally prevails. Scarcely a school can be found in which the microscope does any teaching at all.

In large schools it is difficult to use an ordinary table microscope, on account of the time that must be consumed in showing objects to the pupils one by one, and the solar microscope or lime-light microscope demands costly arrangements. But I think something might be done by adopting the simple device of giving an occasional collective lesson on some selected object with black-board or diagram illustrations, and then placing the actual object under a microscope (a small cheap one with but moderate power would be sufficient), and allowing the *good children* to have a peep at the real thing on their way in or out of school. Making such exhibition a reward for good conduct would greatly add to the current valuation of the show, and the general interest in the instruction it would carry. Even where there is no intrinsic interest or pleasure in any act, it acquires a conventional value if it is treated as a privilege or a reward.

This is not limited to children. Full-grown men grumble loudly on being compelled to sit on a jury, but make huge efforts to obtain the privilege of sitting in the House of Commons.

The Elements in the Sun.—Messrs. Hutchings & Holden believe that they have found good reason for placing platinum on the list of metals which the spectroscope has found in the sun. They detect sixteen coincidences of the solar lines with those artificially obtained. They confirm the presence of bismuth, cadmium and silver which other observers have considered probable, but are doubtful concerning cerium, lead, molybdenum, veranium and vanadium. They are satisfied concerning carbon, which was formerly described as not found. For reasons I stated in "The Fuel of the Sun," chapter xiii., I doubt the possibility of fairly demonstrating either the existence or the non-existence of the non-metallic elements by means of the spectroscope. During the twenty years that have elapsed since that chapter was written a great deal of spectroscopic work has been directed to such investigation, and the contradictory results that have been obtained, especially in reference to oxygen, confirm my early scepticism. With the thin sharply-defined lines of the metals the case is quite different.

Action of Caffeine.—F. Coppola has recently made many experiments on the action of Caffeine on both warm and cold-blooded animals. He concludes that it does not belong to the same pharmacological group as digitalin, because it acts on the heart and the nerve-centres, whilst digitalin and some of its derivatives act exclusively on the heart. He asserts that both strengthen the heart's action by stimulation of its muscular tissue, but they act differently on the frequency of the beat. The chief difference is that caffeine causes dilatation and digitalin contraction of the blood vessels.

Readers of the above should distinguish between "strengthening the heart's action," and strengthening the heart. A stimulant may do the first, but it does not therefore do the second. The reaction following may leave the heart weaker than before. This applies to stimulants generally.

NATURAL HISTORY JOTTINGS.

The Green Tortoise Beetle (*Cassida viridis*).

On August 9th, 1881, I for the first time saw the singular larva of the green tortoise beetle (*Cassida viridis*). It was feeding on the foliage of a thistle that grew on a narrow strip of grass by the wayside. I remarked the canopy of fæces, also the fact of the larva eating out the parenchyma of the leaf from one side, and thus forming rounded spaces, which, from the epidermis on the opposite side of the leaf being untouched, gave a spotted or blotched appearance to the food-plant ; in most instances the epidermis was intact over the eaten-out spaces, while

in others it had broken, probably through contraction by the heat of the atmosphere, and had left holes.

In the several accounts of this larva that I had read, in which reference was made to its remarkable habit of supporting over the back canopy-fashion the fæces, these being carried by the two anal or caudal appendages, I never could realise how this skeleton platform might carry such a substance. However, on closely examining the larvæ, I soon saw how this peculiar feat was accomplished, though anything I had read on the subject never led me to suspect it would be so. The manner in which it is accomplished is thus :—When the first skin is cast, instead of being thrown off altogether, as is usually the case with growing larvæ, it is retained upon the two rigid whip-like anal or caudal appendages, and upon its upper surface are subsequently deposited the fæces which agglomerate, the lateral branched spines of the exuviæ being well adapted for the support and retention of this substance, which is, or shortly becomes, intensely black in colour. When the second skin is thrown off, it likewise is retained upon the anal appendages, and is attached to the first exuviæ on the under side by the cast skin of the two anal appendages, which constitutes a compound connecting link not only between these first two exuviæ but between each and all of the four that are thrown off before the larva is full-grown ; whilst on the upper surface the mass of fæces, gradually increasing in width and height, agglomerates throughout the entire length of the dorsal covering and protection, which the larva has the power of elevating or depressing : when undisturbed, this covering of exuviæ and fæces lies horizontally over the dorsal region of the larva, canopy-fashion, and more or less completely covers and conceals it from view.

Several of these larvæ I secured, and supplied with their food-plant ; and on leaving the country on August 20th, they were shut up in their box, which was not again opened until near the close of September. I then found that all of them had entered the pupa-state, had afterwards fully evolved into the imago condition and hatched out, and were now lying dead on the bottom of the box.

Such were my first few observations and notes on the very singular larva of the tortoise beetle, whilst the desideratum (mentally made) was, further observations thereon. Hence, being again in the same neighbourhood in the summer of 1883, I again searched the thistles in the same spot as before, and in its season found the larva, fed it up, watched its transformations, and made copious notes thereon : these I will give in the order in which they were made, with such additions and modifications as subsequent study of the habits and structure of the larva, pupa, and imago have enabled me to make.

August 11th, 1883.—This evening, at 5.30 P.M., I observed the full-grown larvæ of the tortoise beetle, as well as very small ones, browsing on the leaves of the thistle, at the same place as I observed them two years ago about this same date. It was very airy at the time and quite cool, there being alternations of sunshine and cloud.

I observe that they eat out the parenchyma of the leaf in roundish small patches from both the upper and under surface, leaving the epidermis in most cases intact above or below, as the case may be. The size of these holes is in proportion with the size of the larva, increasing with its growth ; each hole represents a meal, or a course of a meal, and the parenchyma is eaten out by the larva backwardly towards itself with considerable despatch. When feeding, or at rest, the canopy of exuviæ and fæces lies horizontally directly over the dorsal region of the larva, but does not touch it, and extends nearly or completely up to the anterior margin of the thorax, being carried upon the two forward-projected anal appendages. The posterior extremity of the body is turned up at right angles to the anterior and much greater portion ; and the anus is at the extremity of the then erect, cylindrical, and telescopic ventral tube, which is of considerable length and situated beneath the posterior margin of the fecal canopy. The fæces are not black when first deposited, but speedily become so ; and they consist of both liquid and firm parts. The ventral tube is projected to an extraordinary length on the passage of the fæces, chiefly by an evagination of it, and is applied to the hinder margin of the gradually widening and thickening fecal canopy, and the fæces there deposited : this tube, which is in two equal portions fitting into each other, and the body telescope-tube-like, is remarkably flexile, adapting itself readily to the form of the parts to which it is applied, being sometimes bent upon itself at right angles, and at others forming the arc of a circle ; and is, sometimes at least, employed by the full-grown larva in pushing off backwardly from the anal or caudal appendages the fecal canopy (which it invariably does), prior to laying itself up to assume the pupal condition, and also in pushing forwards upon the anal appendages against those that precede it the new exuvial platform, on the shedding of the exuviæ.

(*To be continued.*)

THE DEVELOPMENT OF THE FRESH-WATER POLYZOA.

MR. LORD'S note in SCIENCE-GOSSIP (Dec. 1887), regarding the development of the fresh-water Polyzoa, leads me to suggest the plan, I have for some years adopted, for finding the habitats of these beautiful animals. To the end of my telescopic collecting stick I screw a brass ring about four inches in diameter, to which a very fine cambric net is sown. This net, drawn through the water several times, will secure a concentrated compound of Rotifers, statoblasts of Polyzoa, Volvox, and other organisms too numerous to mention.

At this season of the year I have frequently found the habitats of Polyzoa, by means of their floating statoblasts, in ponds where I had not seen them before, and by searching the same ponds during the next summer and autumn have been often successful in finding the mature animal.

I may mention here, that the *Lophopus crystallinus*

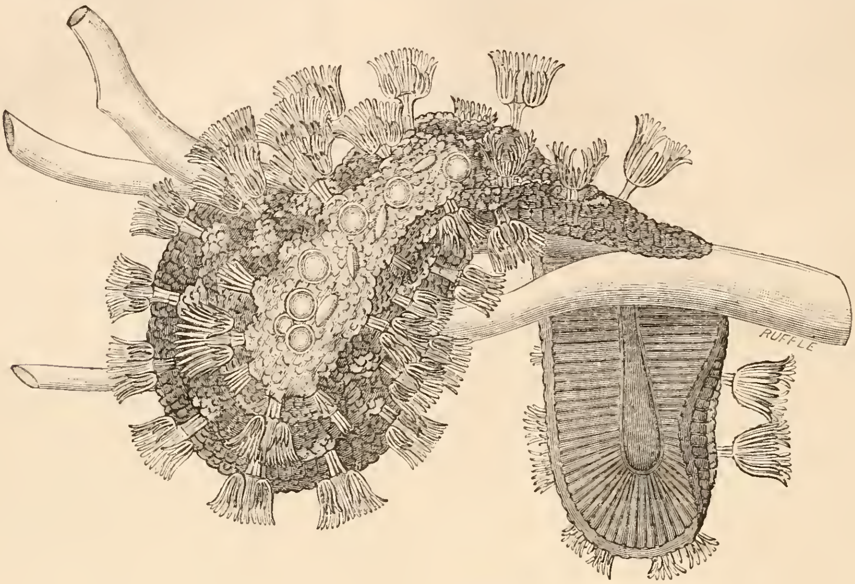


Fig. 45.—*Cristatella mucedo*, enlarged, showing polypes.

is an exception to this rule, as we have always found it fully developed in the winter and spring and not in summer and autumn. It is very remarkable that this naked form should live and thrive in the cold weather, whilst the tubed forms break up and die upon the approach of winter. It is, I think, doubtful if all the statoblasts come to the surface of the water after the disintegration of their tubes, as I have found those of *Alcyonella fungosa* firmly attached to the dead

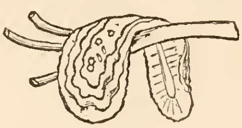


Fig. 46.—*Cristatella mucedo*, nat. size.

sticks upon which these spongy-looking masses grow, and surrounded by fluffy decomposing debris.

Those which float probably remain on the surface until the time arrives for development, when they would attach themselves to any floating weeds or rootlets. I have found *Fredricella sultana* very plentiful in September, and a few alive early in November, when the tubes were full of statoblasts, some of which placed in my aquarium developed on the 11th of February following, and more hatched early in March, and some very young forms were found in the canal on the 25th of March of the same year, 1875. The opening of the statoblast is very curious and interesting, and resembles a bivalve shell (which opens like an oyster) from which the little animal protrudes and soon forms a tube and grows rapidly into a colony. The *Cristatella mucedo* usually break up and die during the month of October, when the statoblasts are numerous, very beautiful, and quite different from any of the other species. They are circular, and have a number of anchor-shaped spines projecting from them, which evidently serve for attachment to the stems of weeds upon which they grow.

A colony placed in my aquarium late in October

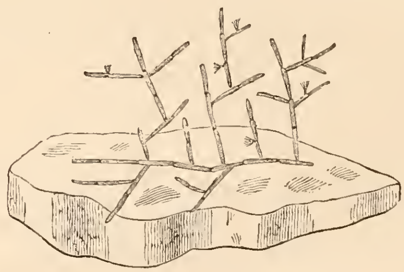


Fig. 47.—*Fredericella sultana*, nat. size.

rapidly decomposed, when the statoblasts were surrounded by a semi-transparent oval sac which floated to the surface, and in time liberated the statoblasts which became free and floated on the water.

None of these developed, owing, probably, to the want of natural surroundings.

The development of *Paludicella Ehrenbergi* is to me the most wonderful, and is altogether the most

interesting. I shall never forget my delight when, in 1877, I first saw this beautiful shy and coy little creature. Its delicate texture, its playful habits, its exceeding beauty, make it a possession to be proud of. I also found it early in March, 1878, when the hybernaculum was developing its young. Dr. Allman states, that the hybernacula have not been seen in this country.

"Van Beneden thus describes the occurrence of Hybernacula or Gemmæ, which under the influence

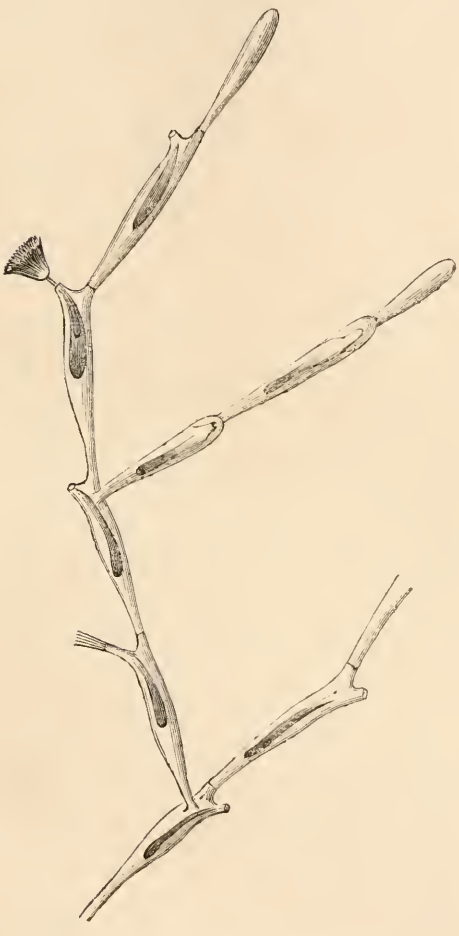


Fig. 48.—*Fredericella sultana*, enlarged, showing polypes.

of a favourite temperature would have grown into the ordinary lateral branches of the polyzoan, but which towards the commencement of winter acquire a conical form, and then become for a while arrested in their development. In this state they remain until the following spring, when the investing membrane splits to allow the elongation of the branch."

The specimens taken from the canal near Chester have, on several occasions in the early spring, shown the process of development described by Van Beneden.

No statoblasts having been seen in this species, it seems pretty certain that this hybernaculum, or club-shaped branch, is the only method of promoting the life of this lovely little creature.

I have lately found (Dec.) these winter buds sealed up ready for next spring, and in two of them I could see, within the tubes, a semi-transparent oval nucleus or sac, which evidently contained the germ for further development.

If Mr. Lord or any readers of SCIENCE-GOSSIP should wish to work out the development and thoroughly study this beautiful class of animal life, I shall be pleased to assist in any way I can, during the little leisure I possess.

THOS. SHEPHEARD.

Kingsley Lodge, Chester, Jan. 1888.

NOTES ON THE EIGHTH EDITION OF THE LONDON CATALOGUE OF BRITISH PLANTS.

By ARTHUR BENNETT, F.L.S.

1059 is *V. fruticans*, Jacq.

1065 *b* is a pubescent variety, formerly quoted in some of the earlier editions of the London Catalogue.

1069 *b*, alter authority to "Berl."

1076 *b* is a large broad-leaved form from Oxfordshire, described by Dr. Boswell in "English Botany."

1079 *b* and *c* are varieties hard to distinguish from one another or the type.

1081 becomes *O. purpurea*, Jacq.

1089 *b* is a Channel Isles' plant, small, and of a beautiful yellow colour all over.

1096 is an added species, supposed to have occurred in the Loch of Spynie, Elginshire, and probably elsewhere, but unless in flower exceedingly difficult to separate or name.

1102, authority, "Hudson."

1104, alter to *longifolia*, Hudson.

1106, authority, "Linn."

1108, authority, "Hudson."

1122 becomes *C. parviflora*, Lam.

1130, hybrid. Gathered by Mr. G. Nicholson, in Surrey, since named *S. Nicholsonii*, Taubert, in "Ver. Bot. Ver. Pr. Brandenburg," 28.

1131, authority, "Huds."

1144 is 986, 7th ed.

1150 is 991, 7th ed.

1165, authority, "Chaix."

1166, authority, "Reich."

1169, authority, "Waldst. and Kit."

1170, alter to *L. juncea*, Berg.

1181 *a* should be *incanum*, Moq., and *C. viridescens*, St. Amans.

1186 *b* should be *rhombifolium*, Muehl.

1194, authority, "Huds."

1196 *b* is a green var. found by Mr. Grant, in Caithness, and Mr. Beeby, in Shetland.

1200 should read *a. acetaria*, Moq., *b. prostrata*, Moq.

1205 *b* is a variety simulating *P. dumetorum*, and often so named.

1208 is 1114, 7th ed.

1224 becomes. *R. limosus*, Thuill.

1229 should read, *b. triangulatus*, Syme, *c. subcordatus*, Warren (both described in the "Exchange Club Reports"), *d. elongatus*, Guss.

1236. The hybrids speak for themselves, others no doubt occur. The Swedish botanists have been studying these plants, and published interesting notes on them in their "Botanisker Notiser."

1231 *b* is 1105, 7th ed.

1263, authority, "Stokes."

1266 *b* is a narrow-leaved var. of rare occurrence.

1274, alter authority to "Gaertn."

Our Salices, with the addition of *S. hippophaefolia*, Thuill., found by Dr. Fraser in Staffordshire, remain much as they were years ago, except that the then newer species have been reduced to varieties.

1320 *b*, authority, "Loudon."

Epipactis. This genus is decidedly not settled, most of the specimens named *atro-rubens* (ovalis of Babington) are to my eyes not so. The only specimens I can refer to the true plant of Babington are those originally gathered by Mr. Tatham, in Yorkshire.

1345, alter authority to "Scop."

It is to be hoped that botanists will gather our rarer Orchids sparingly, such as *O. purpurea*, *O. militaris*, and *O. Simia*—the last has become exceedingly rare, though I think I could find a fair number each year. I once saw twenty-five in flower at the edge of a wood, and noting this in SCIENCE-GOSSIP, I had forty-five letters in the fortnight following. I could only act fairly by answering none.

1358 *b* is a var. found in Surrey, with a narrow drawn-out lip, etc.

1363 is 1274, 7th ed.

1364 is 1279, 7th ed.

1365 is 1275, 7th ed.

1368 is 1278, 7th ed.

1380 *b* is a var. found in Wales.

1390 *a* alter to *a. altilis*, L., *b. prostratus*, L.

1401 *b*, alter authority to "Fries."

1419 is 1330, 7th ed.

1430 is an added species found in Herefordshire, and in 1887 in Scotland. One of Don's "reputed" plants,

1439 *c*, *d*, *e* are three forms added of this varying species; *c*, a water form, *d*, a marsh one, *e*, a condensed one, with flowers and leaves in fascicles.

Juncus alpinus, Vill., has been found in Perth; in 1887 by Dr. White and Mr. Brebner.

1442 *x* is an hybrid between *lamprocarpus* and *acutiflorus*, found by Mr. Beeby, near Hedge Court, Mill Pond, in S.W. Surrey.

1443 *b* is 1372 *b*, 7th ed.

1449, alter to *L. vernalis*, DC.

1454, alter to *L. erectus*, Desv.

1454 *d* is an added name for a pale form of the species, usually taller and more gracile.

1458 is an added species described and figured by Mr. Beeby in the "Journal of Botany," differing from *ramosum* in its fruit, which is more like *simplex*. As yet it has only been found in England. Spargania for naming ought always to be gathered in ripe fruit.

1472 is 1255, 7th ed.

1474 is 1256, 7th ed.

1479 *b* is a form of *natans*, with long drawn-out leaves.

1481 is an added species, found by Mr. Fryer in Hunts. It is probably the true plant, but ripe fruit has yet to be obtained.

1483 *b*. This is a form in habit between *rufescens* and *polygonifolius*.

1487 *b* is a form of *heterophyllus* I found in Cambridgeshire; growing, the plant has much the aspect of *polygonifolius*. The describer of it, the Rev. Morong, placed it under "*gramineus*, L." (our *heterophyllus*); he found it in the United States.

1488 *b* is a slender form of *nitens*, with recurved leaves.

1490 is 1227 *b*, 7th ed.

1491 is an added species figured and described in the "Journal of Botany," from specimens gathered at Cauldshiels Loch, Roxburgh, by Mr. Brotherston.

1492, added species, gathered by the Rev. Ley, in Herefordshire, and identified by Professor Babington, who supposed it identical with *P. Lonchites*, Tuck.

1463, added species, found by Mr. J. E. Griffith, near Aber, in Carnarvonshire, which I was obliged to describe as new in "Journal of Botany"; as yet I have not been able to place it under any recognised species.

1495 *b*. Yorkshire, a peculiar form of *perfoliatus*, with the facies of *nitens* or *heterophyllus* in it.

1496 *b*. Hudson's plant, often when with narrow leaves named *P. obtusifolius*.

1499 *b*, a Norfolk form of the species.

1500 *b*. A Hants and Perth form of *obtusifolius*, the identification of which I owe to specimens kindly sent me by Dr. Lange and Herr Mortenson.

1501 is 1236, 7th ed. It would take too much space to give here the reasons, for and against, this name being used.

1502 *c* is a plant from the Orkney Isles gathered by Prof. Traill, simulating *P. rutilus*, Wolfgang, very much.

1503 is a sub-species of *pusillus*, L., gathered by Mr. Sturrock, in Perthshire; it is a slender pretty plant, different to anything I possess from any part of the world.

1509 *b* is an Orkney plant found by Dr. Boswell, a small mud form.

1511 is a plant with a four-celled anther and fruit not so muricated as the usual form.

1512 is 1242, 7th ed.

1513 *b* is the Orkney plant.

Potamogeton coriaceus, Nolte (Cambridgeshire), should have been in the Catalogue.

(*To be continued.*)

ASTRONOMY AND METEOROLOGY.

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

THE first meeting of the Royal Astronomical Society for the new session was held on March the 9th. A number of papers had been received on observations of the total lunar eclipse of the 28th of January.

In a paper sent by Dr. Dyer on the observations made at the Armagh Observatory, he stated that he recorded seven disappearances and two reappearances of stars, and called attention to the fact that about the middle of the eclipse, when viewed with the naked eye, the moon looked like a bright disc with a dark triangular shadow on it. Mr. Rambone, of Dunsink, sent a paper of observations, in which he recorded seventeen disappearances and eighteen reappearances, upon the red colour visible on the moon's disc.

In the discussion which followed the reading of these papers, Captain Noble said that he observed that the body of the moon was almost chocolate-red, whilst the limb seemed to be of a silvery green. (The writer would suggest, that this appearance of a bright green tint on the limb was doubtless only a complementary colour produced by the red in the eye of the observer.) This suggestion was made by the Astronomer Royal in summing up the discussion.

In May there will be no occultations of any star as large as a fourth magnitude.

Mercury will be an evening star in the last two weeks of the month, and will be situated in the north-west after sunset.

Venus will be a morning star in Aries, but will enter Taurus in the middle of the month.

Jupiter will rise in the evening in Scorpio.

Meteorology.—In May the Isotherms assume roughly the form of the letter S placed on its back across England. At Haverfordwest the mean average temperature is 53°. The isotherm of this temperature first falls to Swansea, then rises to Leicester and again falls through Rutland and between Ipswich and Chelmsford to Canterbury.

The Isotherm of 52° passes through Blackburn, rises to York, and then falls to Hull and Norwich.

The Isotherm of 51° passes through Kirkcudbright, rises to Jedburgh, and then falls to Norwich.

At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 17th of March was 28·60 in. on Sunday afternoon, and the highest 29·88 in. at the end of the week. The mean temperature of the air was 37·2 deg., and 3·8 deg. below the average. The direction of the wind was variable. Rain fell on every day of the week, to the aggregate amount of 0·95 in. The duration of registered bright sunshine in the week was 10·8 hours, against 10·1 hours at Glynde Place, Lewes.

For the week ending 24th of March the highest reading of the barometer was 30·07 in. on Wednesday evening, and the lowest 29·06 in. at the end of the week. The mean temperature of the air was 34·7 deg., and 7.0 deg. below the average. The general direction of the wind was N.N.E. Rain fell on five days of the week, to the aggregate amount of 0·66 in. The duration of registered bright sunshine in the week was 11·3 hours, against 3·1 hours at Glynde Place, Lewes.

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in May.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	6	4 16M	11 36M	6 56A
	13	4 16M	0 8A	8 0A
	20	4 25M	0 43A	9 1A
	27	4 42M	1 14A	9 46A
Venus ♀	6	3 56M	10 49M	5 42A
	13	3 44M	10 54M	6 4A
	20	3 34M	11 0M	6 26A
	27	3 26M	11 7M	6 48A
Mars ♂	6	4 9A	9 51A	3 38M
	13	3 37A	9 19A	3 5M
	20	3 7A	8 49A	2 35M
	27	2 42A	8 22A	2 6M
Jupiter ♃	6	8 48A	1 9M	5 26M
	13	8 16A	0 38M	4 56M
	20	7 44A	0 7M	4 26M
	27	7 12A	11 32A	3 56M
Saturn ♄	6	9 16M	5 13A	1 13M
	13	8 51M	4 47A	0 47M
	20	8 27M	4 22A	0 20M
	27	8 2M	3 57A	11 52A

For the week ending 31st March, the lowest reading of the barometer was 28·57 in. on Wednesday afternoon, and the highest 29·80 in. at the end of the week. The mean temperature of the air was 40·0 deg., and 3·4 deg. below the average. The direction of the wind was variable. Rain fell on six days of the week, to the aggregate amount of 0·87 of an inch. The duration of registered bright sunshine in the week was 11·2 hours, against 13·4 hours at Glynde Place, Lewes.

For the week ending 7th April, the lowest reading of the barometer was 29·58in. on Monday afternoon, and the highest 30·09in. on Friday morning. The mean temperature of the air was 37·1 deg., and 9·1 deg. below the average. The general direction of the wind was north-east. Rain fell on two days of the week, to the aggregate amount of 0·08 of an inch. The duration of registered bright sunshine in the week was 29·0 hours, against 29·7 hours at Glynde Place, Lewes.

For the week ending 14th April, the highest reading of the barometer was 29·93 in. on Tuesday evening; and the lowest 29·59 in. on Friday morning. The mean temperature of the air was 42·2 deg., and 4·9 deg. below the average. The direction of the wind was variable. Rain fell on four days of the

week, to the aggregate amount of 0·11 of an inch. The duration of registered bright sunshine in the week was 21·5 hours against 13·4 hours at Glynde Place, Lewes.

The average rainfall for May is 1 in. for the whole of the east coast and a great part of the south coast, and 2 in. for the whole of the west coast and a portion of the south-east coast by the North Foreland, while it reaches 3 in. in a few places in Cornwall, North Wales and the English lake district.

THE STORY OF THE GREAT AUK.

EIGHTY years ago a boat's crew landing on an island lying off Reykjanes, on the coast of Iceland, chased, killed, and ate the great auk to its heart's content. So recklessly did the sailors go to work that they indiscriminately trod underfoot innumerable eggs and also a vast number of young birds.

So abundant was the great auk at that time that no one then could ever have dreamed that in less than a century it would follow in the footsteps of the dodo, the apteryx, and the solitaire, and become an extinct and almost mythological creature. Still less can we suppose that any one of the "Salamine's" crew could have deemed it possible that the eggs which he so remorselessly crushed would one day attain such a value that £225 would be paid for a single specimen. Yet such things are facts. The bird has been improved off the face of the earth. It no longer exists—a few stuffed specimens—a jar or so of spirits encasing its remains, a few bones, and less than seventy eggs, alone bear witness to the fact that the great auk once dwelt among us.

With only seventy eggs in existence, and no further supply forthcoming, it may not seem so surprising that on the 12th day of the month of March last Mr. Stevens, of King Street, Covent Garden, should be able to sell a very fine egg of the great auk for £225. As an instance of the rapidly increasing value of this specimen it has been stated that it had been in the possession of its late owner since 1851, when it was purchased for £18.

No egg of any kind has ever realised so large a sum as that fetched at the recent sale, although a similar relic of the great auk changed hands in December last for £168.

The great auk belonged to the genus of web-footed birds called auk (alca) the type of a family named Alcadæ. The members of this family are remarkable for the shortness of their wings, which they employ as fins or paddles for swimming under water—some being even incapable of flying, and for the position of their legs further backward than in other birds, which makes walking difficult, and compels them when on land to maintain an upright attitude. They are distinguished by the very compressed bill, which in the true auks is vertically elevated, and so sharp along the ridge as to resemble the blade of a knife; and by their entirely graduated feet, destitute of hind toes. The auks are entirely confined to the seas of the northern hemisphere (the penguins taking their place in the southern) and are most abundant in the cooler regions. All of them have a dense plumage, which generally exhibits on its surface a beautifully polished appearance and silvery lustre.

The great auk, now extinct, in size as large as a goose, was strictly an oceanic bird, rarely leaving the water; but when sojourning on land usually selecting the spots most inaccessible to man. Its winter plumage appeared in autumn, when its cheeks, throat, forepart, and sides of neck were white. Its summer plumage commenced to appear in the spring, when the white on the head became confined to a large patch which extended in front and round the eyes; the rest of the head, neck, and upper plumage was of a deep black. It has been said that this bird was deprived of the power of flight, not from any peculiarity in the structure of the wings and feathers, but simply on account of their diminutive size. This, however, appears to be an incorrect statement, inasmuch as Professor Owen has declared, "The proportion in which the skeleton [of birds] is permeated by air varies. In *Alca impennis* (*i.e.* the great auk), the penguin and the apteryx, air is not admitted into any of the bones. The condition of the osseous system, therefore, which all birds present at early periods of their existence, is here retained through life." Hence we see that their wings did possess a peculiarity of structure, fitting them for paddling purposes rather than for flight.

It was formerly an inhabitant of Newfoundland, Labrador, and Iceland, and a somewhat rare visitant, at least of late years, of Norway and Sweden, and of the Orkney, Shetland, and Hebrides Islands. To compensate it for its inability to fly it was enabled, as we have seen, to move with great rapidity under water. Thus it is related how, in 1812, Mr. Bullock chased one of these birds in the Orkneys in a boat manned with six oars, and although every effort was used to capture it, the bird outstripped its pursuers and escaped. This was one of two birds which for some time had been seen in the neighbourhood, and was well known to the people as the king as the other was as the queen of the auks.

It was killed a fortnight afterwards, and came into the possession of the authorities at the British Museum.

In common with most of the Alcadæ, the great auk laid only one egg, and this upon the bare rock, without any attempt at a nest. The eggs varied in size; thus of four in the possession of one collector the sizes were as follows:—(1) 5 inches, by 2 inches 10½ lines; weight, 31 scruples 10 drams. (2) 4 inches 10½ lines, by 2 inches 11½ lines; weight, 41 scruples

9 grains. (3) 4 inches 7 lines, by 3 inches 1 line; weight, 40 scruples 9 grains. (4) 5 inches 1 line by 3 inches; weight, 38 scruples 15 grains.

The colour, also, was variable, some being of a silvery white, others yellowish-brown and purple. The spots and streaks differed much in colour and form, some being yellowish-brown and purple, others purple and black, whilst others, again, were of intense blue and green.

This bird so recently as 1843, only forty-five years ago, was included by Yarrell in his list of British birds, rare it is true, but still a British bird which within the memory of man has become totally extinct; and although, as Professor Owen has remarked, such extinction was not wholly brought about by the hand of man, as in the case of the dodo and the dinornis, it is a fact that the barbarism which finally removed it from terrestrial existence was certainly due to man's agency, and may be reckoned as one of the features of the march of civilisation in this nineteenth century.

The latest authenticated notice of the existence of this bird, occurs in connection with Eldey Island, off the coast of Iceland, from whence the last two birds taken alive, were procured in 1844. Their remains (the birds were dissected) are now preserved in spirits in the Royal Museum at Copenhagen. It is true that a tale is told concerning one Johannes Propert (a half breed of Disco Island), who declared that he met with the great auk so recently as 1859. He related the circumstances to Mr. Brown, who repeated the story before the Zoological Society.

According to this story, Propert and his companions saw two birds, they captured and ate one, the other escaping. The refuse of the one was given to the dogs, who left but one feather behind, said to have been afterwards found. But, as Mr. Brown observes, inasmuch as Propert was a very intelligent man, and well knew that the authorities at Copenhagen had offered a valuable reward for a specimen, it is utterly impossible to suppose, that on seeing such a rare and highly-prized bird he would shoot and eat it. Moreover, in 1868, only nine years after, Mr. Brown found that the inhabitants of Disco Island, where the pretended capture is said to have taken place, had lost all memory of the bird, although, on the mention of its Icelandic name Isarokilsoc, they at once declared, "That means 'little wing,'" than which a better or more forcible description of the bird could not be given.

It is worthy of note that the birds which have become extinct within historical memory were all little-winged birds. The dinornis of New Zealand, known to the natives as the moa, was in existence if not in the last century at least in the seventeenth. It was decked in gaudy plumage for the sake of which, as well as for its flesh, which was highly esteemed, it was doomed to destruction and final extinction. It is described as being utterly incapable of flight.

The dodo of Mauritius, described by several voyagers of the sixteenth and seventeenth centuries, and brought alive to Europe on more than one occasion, had wings so short as to be of no use for flight. It was therefore unable to cope successfully for existence against man, who esteemed its flesh as a tender morsel.

Again, the great auk of the northern hemisphere, as we have seen, possessed wings of a character wholly inadequate to enable it to fly. Its doom seems to have been foretold by one of our old voyagers, Capt. Whitbourne, who in 1620 thus describes it:

They are as big as geese and fly not, for they have but a little short wing, and they multiply so infinitely upon a certain flat island that men drive them from thence upon a board into their boats by hundreds at a time, as if God had made the innocency of so poor a creature to become such an admirable instrument for the sustentation of man.

Capt. Whitbourne's description of the means adopted for the wholesale capture and destruction of the great auk is corroborated by many other ancient writers. Thus, in Mr. Hore's Voyage to Newfoundland, in Henry VIII.'s reign, we find in Hakluyt: The Isle of Penguin, which is very full of rocks and stones whereon they went and found it full of great foules, white and gray, as big as geese, and they saw infinite number of their eggs, the foules they flead and their skinnes were very like hony-combes: full of holes, being flead off: they dressed and ate them and found them to be very good and nourishing meat. And again, in proof of the wholesale destruction of these birds, rude stone enclosures or pounds were, until very recently, commonly to be met with at various places in the northern hemisphere—silent memorials of the means adopted for the capture and final extinction of this unhappy bird.

Nor is it unworthy of note that Yarrell records how Frenchmen visiting the haunts of the great auk in the sixteenth century (1536), slaughtered and victualled themselves upon its flesh, salting down what they could not eat at the time; and again, how the natives not only pursued them for the sake of their flesh, but with a view to making garments of their down. The habits of the bird were evidently well known in the sixteenth century, as we gather from Tusser's "Husbandry," 1580:

> "In husbandry drowseth at fortune so auke,
> Good husbandry rowseth himself as a hauke."

The earliest reference to the great auk as a British bird, occurs about 1680, under the name of gare-fowl, in an account of St. Kilda by the Lord Register, Sir George McKenzie, of Tarbat.

The latest British specimen taken alive was at Waterford Harbour, in 1834. Since this last date the birds appear to have confined themselves to three islands off the coast of Iceland, and in particular to Eldey Island.

The submersion of this island brought great destruction upon them; but a whole colony escaped to another island, which made its appearance at the same time in the immediate vicinity of their former home. To this island the name of Eldey was at once transferred. It was the last known home of the great auk. For fourteen years systematic expeditions were made to this island, and some sixty birds and a number of eggs were despatched from thence to Copenhagen.

A single bird in 1834 is known to have fetched £8; the two last captured in Iceland £9, and about the same time £20 was refused by certain fishermen in Iceland for two auks and two eggs.

A recent issue of the "Illustrated London News" gives the following statement, with reference to the gradual increase in the value of the few remaining eggs—

1852—2 eggs sold for		£29 and £30.
1856—1 egg	„	£21.
1865—4 eggs	„	£30 (average).
1869—1 egg	„	£60.
1880—2 eggs	„	100 and 102 guineas.
1887—1 egg	„	£168.
1888—1 „	„	£225.

The same paper also adds that of the sixty-seven recorded specimens extant, twelve are to be met with in eight British museums, and thirty-two in British private collections.

The Rev. J. G. Wood records that, owing to the extreme value attached to these eggs, and the high price which they fetch in the market, various ingenious attempts have been made to forge copies. Not many years ago, he adds, several apparently genuine auk's eggs were offered for sale at a low price, but they turned out to be nothing more than forgeries admirably manufactured, and really valuable as copies of the egg. This attempt at fraud is scarcely to be wondered at, when such fabulous prices as those above recorded are given for a single specimen.

S. Coode Hore.

264, *Dalston Lane, Hackney, E.*

SCIENCE-GOSSIP.

During the approaching summer a new branch of the London Geological Field Class will make a detailed study of the chalk formation about London, under the direction of Professor H. G. Seeley, F.R.S. The other branch, under the same direction, will follow the course of former years by investigating the principal geological features in the neighbourhood of London. Full particulars can be obtained by intending students on application to Messrs. G. Philip & Son, 32, Fleet Street, and from many booksellers in the suburbs.

During March and April, Dr. J. E. Taylor, Editor of Science-Gossip, delivered lectures on various subjects connected with geology and natural science before large audiences in Ipswich, Northampton, Chelmsford, Loughborough, Lowestoft, Manningtree, Hadleigh, and elsewhere. He is now booking a few engagements for next winter.

The "Dicky Bird" Society in Newcastle now numbers no fewer than 148,000 children-members, all of whom are pledged to discourage birds-nesting, catching, etc.

The French Association for the Advancement of Science recently met at Oran, in Algeria.

Mr. Howard Saunders is the author of a very attractive-looking book, capitally illustrated, now appearing in shilling monthly parts, entitled "An Illustrated Manual of British Birds." Publishers: Messrs. Gurney & Jackson.

The well-known "Introductory Text-Book on Geology," by Professor David Page, has been re-written by Professor C. Lapworth, and is now, therefore, one of the best in the field.

The first part of Mr. R. A. Proctor's "Old and New Astronomy" has been published. As was expected, it promises to be the finest work of the kind yet issued.

No fewer than ten Fellows of the Royal Society have died within four months. Their average age was 79, so that science is long-lived.

The "Selborne Magazine" will in future be published by Mr. Elliot Stock.

ZOOLOGY.

The Genus Clausilia.—On p. 26 I suggested a possible explanation of the presence of species of Clausilia in the West Indies and South America, the genus being absent in North America. I have since received a copy of Conrad's list of the Eocene fossils of North America, and find the problem complicated by the presence of three species, *C. contraria*, *C. vermicula*, and *C. teres* in the Eocene strata of Dakota. (There is a European *C. teres*, Oliv., which I believe has priority, in which case *C. teres*, Meek & Hayden, may be called *C. occidentalis*.) At present I am unable to offer any satisfactory explanation of the existence of these Dakotan species, and commend the matter to conchologists for solution; but it is just possible their origin was Asiatic, as there are several of the genus in Japan and China (the Japanese *C. martensi* being one of the largest species of Clausilia), and in many ways the fauna of Eastern

Asia is related to that of North America—a subject on which I may have more to say later on. With regard to the origin of Tudora in Europe (p. 26) it is possible that the ancestor of *T. ferruginea* was carried across the Atlantic on floating timber by the Gulf Stream, as the operculum would help it greatly in resisting the influence of sea-water. And it is noteworthy that the *T. megacheila*, of Curaçoa, has a habit of climbing trees.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

GRAPTA C-ALBUM.—On page 44, your correspondent A. G. T. has a note on *Vanessa* (*Grapta*) *C-album*, asking whether it is known to be double-brooded. In reply, I may say that Mrs. Hutchinson has proved without doubt that it is so, and has recorded her observations in the "Entomologist's Monthly Magazine," 1887, p. 186. Mr. W. H. Edwards has some very interesting remarks on this species in "Canadian Entomologist," 1887, p. 2, in which he shows that *C-album* is represented in America by three species: *G. comma*, *G. satyrus* and *G. faunus*. Now the first two differ from *G. C-album* in their preparatory stages, but *faunus* is still held by many authors to be a race of *C-album*. Mr. Edwards continues, "*Faunus* is a sub-boreal species, flying from one ocean to the other . . . and being boreal and one-brooded, it is fair to presume it came from the north; that at the time, ages ago, when the two continents were united, the species occupied the northern parts of both. When the separation took place, the European branch split into numerous varieties, and became double-brooded, yet retained its identity as one species . . . one multiform species." So he concludes that *faunus*, a single-brooded, unvarying boreal species, is near to the primeval type from which sprung the one variable European species and the twelve known North American species. [P.S. —I may mention that the cause of the destruction of insects frequenting lime-trees (p. 43) is the tomtit (*Parus*) and no poison.]—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

ENTOMOLOGICAL SOCIETY OF LONDON.—At the last meeting of this society, Mr. Goss read a letter from Mr. Bignell, correcting a statement made by Mr. Poulton at the March meeting of the society, to the effect that the variety *valezina* of the female of *Argynnis paphia* did not occur in Devonshire. Mr. Bignell said that the var. *valezina* was included in Mr. Reading's "Catalogue of Devonshire Lepidoptera"; and further, that he had himself taken specimens of this variety in Bickleigh Vale, Devon. Mr. Waterhouse read a paper entitled "Additional Observations on the Tea-bugs (Helopeltis) of Java," and exhibited a number of specimens of these insects. He said that the species infesting the cinchona in Java was supposed to have been introduced from Ceylon in tea, but that he had discovered that the species on the tea and on cinchona in Java were distinct, and that both species were distinct from *Helopeltis antonii* of Ceylon.

GEOGRAPHICAL DISTRIBUTION.—Mr. T. D. A. Cockerell will allow me, I know, to make the suggestion—considering so little is known at present of the why and wherefore of the distribution in space of the land and freshwater mollusca—that the distribution in time be the only test; and that if any one given species, or any form of which we may reasonably expect it to be a derivative, be found in the pliocene or anti-pliocene fauna of a district or section, then we may believe it to be an autochthon of that district or section. For example, should *Planorbis parvus*, or some one species closely allied to it, be found fossil in the pliocene or anti-pliocene formations of the countries reckoned in his boreal section, then we may more positively aver that its "metropolis" of distribution was a northern one. His proposed test (*ante*, page 25) seems to me scarcely to hold water as a special way of working by the very exceptions he makes to the rule he has formulated, because colonists have certainly taken over many species of which there could, by their very ignorance of natural history, be no record; and if a prolific species were taken over it could delude a naturalist visiting the country after a lapse of years into reckoning it as indigenous, by reason of its attained distribution, when it was only an immigrant after all.—*J. W. Williams.*

CONCHOLOGY.—I have just got two advance copies of a new work on the British Unionidæ. It consists of illustrations of a hundred different forms of Unios and Anodons. There are no descriptions, but there is an introduction in which the types of various authors (1804–1879) are reproduced, to show the confusion that has existed in regard to type forms. The first edition, which is preliminary and subject to alteration, is limited to about twenty copies. The second and revised edition, which may number one hundred copies, is designed to contain short descriptions, together with exact localities for each form illustrated. It may be remarked that the author is a follower of the splitters, and some of the new-named forms are in my opinion too near others to be separated.—*Geo. Roberts.*

THE BRITISH SLUGS.—The author of the interesting papers entitled "Slug Gossip," which appeared in SCIENCE-GOSSIP for last year, proposes (p. 244) the use of *Lehmannia* as a genus. It is, however, at best only a sub-genus, and is only used as such by its author, Heynemann ("Die nackten Landpulmonaten des Erdbodens," p. 85), who includes in it *Limax arborum*, *L. flavus* (*variegatus*), *L. cærulans* and *L. montenegrinus*. It would appear, however, that *Agriolimax*, Mörch, containing the British species *agrestis* and *lævis*, must be accepted as a true genus,

as Simroth, who has carefully investigated the anatomy of the European Limaces, finds it fully distinct, and more nearly allied to *Amalia* than to *Limax*. In discussing the species of *Arion* (pp. 265, 266), the author proposes to unite *bourguingati* with *subfuscus* as a variety. Simroth and others have nevertheless detected anatomical differences, and I cannot imagine any one familiar with the outward appearance of the two species failing to distinguish them. "*Arion albus*," of Linné, is a variety of *A. ater*. Various forms have been described as *albus*, *flavus*, etc., but it does not appear to be proved that any of them are good species, unless *flavus* is really identical with *Arion minimus* of Simroth.—*T. D. A. Cockerell, West Cliff, Colorado.*

Lacuna pallidula.—I find the *Lacuna pallidula* and *Lacuna divaricata* are rather common at low-water mark, on Laminaria, etc., on the Isle of Wight coast, about Luccombe.—*J. C. Eccles, Ventnor.*

MICROSCOPY.

Enock's Sketches.—If anything would tempt a young man to the study of natural history, it is the periodical series of "Sketches" and "Slides" illustrated by the sketch, which Mr. Fred. Enock is bringing out. The last slide (accompanied by the usual carefully-drawn, detailed sketch and with a minute description) is devoted to the spinnerets of spider (*Epeira diadema*), female, prepared without pressure. The object, therefore, retains all its natural form and colour, and is perhaps the best Mr. Enock has turned out—which is saying a good deal.

Mr. Cole's Slides Redivivus.—Microscopists and natural history students generally, will be pleased to hear that Mr. Arthur C. Cole is in the field again. We have received his new catalogue of microscopical preparations, educational, physiological, pathological and botanical. All workers should forthwith procure this catalogue, for they will be sure to find something in it they want. Accompanying the catalogue were the following beautifully mounted slides, in Mr. Cole's best manner:—"Budding of Stem of Citron," "Feathers in follicles," "Growing point of Mistletoe," and "Vertical Section through *Triton cristatus*," showing the abdominal organs, etc.

The Quekett Club.—The last "Journal" contains the following papers:—"On the Structure of Butterfly and Moth Scales," by T. F. Smith; "On the Formation of Diatom Structure," by E. M. Nelson; "Notes on Villi on the scales of Butterflies and Moths," by Dr. Royston Pigott; "Parasitism" (address of the President, A. D. Michael); Reports, Meetings, Lists of Members, etc.

BOTANY.

Autocopyist Illustrations.—Mr. J. Clayton recently read a paper before the Bradford Naturalists' Society on *Pinus sylvestris*, which was copiously illustrated by sectional and other details, all of which were duplicated by an autocopyist apparatus, and each member who heard the paper was furnished with a sheet of drawings, and another of explanations. This is a novel and clever method of enabling a scientific audience to follow the reader of a paper, both in his matter and illustrations.

GEOLOGY, &c.

Margate Flints.—Fossil sea-urchins in a silicified state, commonly known as shepherd's crowns, are familar to every dweller on the English chalk downs, and to the contemplative mind often form the subject of an hour's wonderment during a country walk where the birds trill sweet melody in the hedge-rows. Especially curious do they appear to those who first meet with them beside some flowing river lined with purple osiers or by the quite margin of the sea waves, where the idea of the living things around being changed into flint appears to the human mind an all unfathomable mystery. I have known a singular instance of a gentleman of superior professional attainments and agreeable linguistic cultivation, who in the Martinmas summer of extreme old age occupied himself with an endeavour to prove, that flints were the relics of a former world destroyed by the deluge, and whose crowning satisfaction was the production of an illustrated volume, at a considerable outlay, in which the general reader might be startled to find variously identified silicified monkeys, lady's slippers and an Egyptian priestess, black but comely. He had firmly convinced himself, and no less convinced certain of his townsfolk, for he was likewise a ready speaker, that the deluge poured in over the south-eastern shores of England and washed all these defunct oddities and more into his geranium beds. One of his cherished fancies I recall was to convert the authorities at the British Museum, with whom he claimed to be at variance, to these most singular views, and to this end, he once in good faith pressed upon my acceptance a sea-urchin partially embedded in a flint-stone, which he averred could be naught else but a sea-bird overwhelmed when in the act of masticating the said delicacy; the gist of the argument here as elsewhere being that his flint fossils preserved their forms and integuments, a circumstance which if once admitted, all the rest very naturally followed. The authorities in question, I chanced to hear, professed themselves alive to the matter in dispute, which whatever charms it may have exerted on the antiquarian ear did not distinctly

recommend itself to any of their modern views of classification, and thus the genial topic of an afternoon's visit found no niche in that temple of fame now blazoned with the name of Sir Charles Lyell; for nature had not yet fled her chosen haunt at Bloomsbury. The marvellous flint which for other reasons I retained, has preserved kindly recollections of the donor, and it has always appeared invested with a certain interest, not indeed as reviving the aforementioned rationalistic views of Omar el Aalem or as recalling the dreamy echoes of Ovid and tales of the Caliphs, glittering with a fond notion of the repopulation of the globe from vivified flints, an idea not so wholly idle as put by the Kaffir boy, since dust and shadow are we all, but as simply recording how such blameless things as Echinoderms have become thus wondrously metamorphosed. To the generality of minds, evidently this hard flint was once soft and plastic, and the sea-urchin, so to speak, had stuck into it, as a sea-shell sticks into a lump of mud; the flinty matter permeated it, and eventually hardened it precisely as fruit is candied in syrup. Had the urchin afterwards become detached from the mass, as is commonly the case, we should have seen the result of nature's handiwork and not the process, and our minds would have become prepossessed with vague notions of the marvellous. Sometimes it may be, we unwittingly pass by the cast away article from the great world laboratory driven by the sun, retaining the impress of the process, and rendering not wholly vain the notion of those who have fancied that fossils were imperfect models employed at the creation, considering likewise that creation to be in progress. On the Downs it is the precedent to mend the roads with flint, although there can be little question that a few cart-loads of sea sand as tending to form a concrete with the chalk would be preferable, as economising both money and labour. The other day, walking out on the Ramsgate and Margate road, I observed a heap of shingle, newly thrown down as the navvies quaintly say for road metal, and my eye fell upon a flint with a pecten or scallop adhering to it, which deserves to be depicted as it tells so plainly the story of its fate; geology being a great book of earthly leaves recording births, marriages, and deaths, a glance at it tells its history, so that no recording angel could be at fault. Once at the decease of its occupant it chanced to repose upon a mass of soft and yielding flint lying at the bottom of the channel of those days. Flints are naturally moist and brittle when new from the quarry, but then they must have had the nature of putty, for the chalky mud as it accumulated above pressed it into the future stone, and finally with its weight broke the shell into four as if impatient to destroy the die. The shell remains filled with the chalk, the flint projects over the edges, and a spray of flint globules resembling crystallised sugar are squirted over its surface; the simple but complicated result of squeezing. Time has effected the rest, and hardened what was mud to chalk and stone, but the white rind on which the shell is cushioned shows plainly that it was not covered by the soft flint, but that it reposes on it as it fell, beautiful in death. How it comes about that our cliffs are scored with lines of irony flints it is easy to surmise and difficult to prove; silica and iron are ejected in mineral springs, and they enter into the microscopic shells that strew the sea-bed; a broken flint no less than the chalk is composed of minute layers of granules, presumably either the said diatom paste or globigerina ooze, which Sir Wyville Thomson described when brought up by the Challenger dredge as a cream or red-brown powder. Possibly red and white were then the virgin hues of the chalk cliffs, and if this be so, black and white is but their pale shade. When the black flints of Dover on Blanc Nez are pounded by the surges into red sand, the things that were return; Margate flints however are naturally rust-coated, red-brown, or suffused with red coralline mesh work, more or less resembling a mineral I have labelled as jasper; not however the Cyprian jasper, "di color verde sprozato di sangue," for this poetical substance, that has been considered more precious than life and eloquent than words, is probably common blood-stone. The pure white rind of the flint on which the scallop reposes is also powdered with ochreous red, but this truly is sand such as scallops love, the earliest sands of Pegwell Bay dear to the shrimps. What is its kin and lineage, Plagiostoma or Pecten, I will then leave to the curious, for to my mind the broken shell recalls that all-impressive idea of the poet:—"Shall man be sealed within the iron hills, or blown about the desert sand," and dead it speaketh.—*A. H. Swinton.*

Boulders in the Carboniferous Limestone of Dublin.—At a recent meeting of the Geological Society a paper was read by Professor Ball on this subject. He said that angular fragments of granite and of schist, quartzite, and vein-quartz, such as might have been derived from the metamorphosed rocks which rest on the granite near Dublin, have been discovered in beds of carboniferous limestone, which often contain fragments of fossils, especially Encrinites. They have been previously noticed by several geologists. While Professor Jukes refers their transportation to the agency of land-plants, Mr. Croll quotes their occurrence in support of his argument as to the existence of glacial conditions during the carboniferous period. Professor Ball observed that the specimens exhibited none of the indications of the existence of glacial conditions, whether we regard the characters of the boulders or the nature of the rock in which they are imbedded, which contains no such silt as that occurring in the boulder-bed of the talchir formation. Whilst rejecting the view that they were transported by ice, he pointed out

that they need not necessarily have been carried by land-plants, but that they might have been torn from the sea-floor by marine algæ, some of which may have have had a more buoyant character than those of modern seas. He cited the case of a sandy beach in the neighbourhood of Youghal, which is strewn with limestone fragments, which had been conveyed by sea-weeds thrown up after storms from submarine banks. It was suggested that the occurrence of natural fissures in the rocks and cracks produced by concussions from large masses, hurled about by the waves, might sufficiently explain how the fragments could be freed from the main mass of the reefs under the stress of the waves.

NOTES AND QUERIES.

A Spider's Contrivance.—When residing in Lugano, in Switzerland, some time ago, I was much interested in observing the method by which a garden spider had adopted to keep its web extended under difficulties. I had four small pollard acacia trees about seven or eight feet high, planted in tubs, nine feet apart, in front of my house. A garden spider (*Epeira diadema*) had spun its web between two of the trees, and had made fast its threads, or stays, to various top and side branches; but as there happened to be no branches to which it could fix its threads below the web, it must have thought of some other means, and devised a mechanical contrivance for the completion of its web by placing a weight on the lower side of the web to serve as a stay. The spider must therefore have descended from its half-finished web to the gravel walk by one of its threads, and selected a small stone, nearly ¼ inch cube, to which it attached the thread by which the spider had descended; then by running up this thread to the web, it hoisted up the stone to an elevation which it considered a safe position, and out of the way of any small animal that might pass underneath the web. The stone was hanging about two feet off the ground, and three feet below the spider's web. It was oscillating with the wind. I placed my hand very gently under the stone and raised it up an inch or two, upon which the web immediately began to collapse, but, on lowering my hand again, the web became extended as before.—*G. E. G.*

Kangaroos on Leith Hill.—Some fourteen years ago some kangaroos, kept in confinement by Mr. W. J. Evelyn, Wotton House, escaped and made their home on the common on Leith Hill and surrounding district, where they have lived and bred ever since. There is no abundance of them, however, and great regret was felt some three years ago when one was shot. Another has just been killed by a large dog, and as it is felt that these interesting and timid creatures should be propagated rather than destroyed, it is to be hoped that persons passing over the hill will be careful, when accompanied by large dogs, to see that they do not attack or destroy the only specimens of the kind running wild in this country. The above paragraph from the "West Sussex Gazette" of Feb. 2nd last is interesting.—*William Jeffery, Ratham, Chichester.*

Heron and Water-Rat. — It may interest W. Finch, jun. (Science-Gossip, p. 7), and other of your readers, to know that Captain Knox in his "Ornithological Rambles," 3rd edition, published in 1885, has figured a heron flying off with a water-rat. Also I have been told by a Chichester bird-stuffer that he, in one season, took three water-rats from the stomachs of herons sent to be preserved. In corroboration of the remark as to a heron capturing a 2 lb. trout, which seems almost incredible, a friend of mine told me a few days ago, of a heron, on being chased by a rook, dropping a trout which was ascertained to weigh 2 lb.—*William Jeffery.*

Shooting Immigrant Birds.—I truly sympathise with your correspondent in last Science-Gossip, who wishes "to raise a howl of execration against the shooting of our immigrant birds." The most practical remedy I can suggest to prevent this bird slaughter, is to take every possible opportunity of enforcing the provisions of the Wild Birds Protection Act of 1880, by which all wild birds are protected, more or less, between 1st March and 1st August. Every offence against this Act, if supported by satisfactory evidence will, I am sure, be readily taken up by the Society for the Prevention of Cruelty to Animals, if reported to the secretary, and the culprit brought to justice, and I can say from actual experience, that a single conviction in any district will have a most salutary effect. At this time of year it may be useful to shortly state, that it is an offence against the Act for any person in the United Kingdom, between the 1st March and 1st August, (1) To shoot, or attempt to shoot, or use any boat for the purpose of shooting, or causing to be shot, any wild bird. (2) To use any lime, trap, snare, net, or other instrument for the purpose of taking any wild bird. (3) To expose for sale, or to offer for sale, or to have in his possession after the fifteenth day of March, any wild bird recently killed or taken. (4) Any person who shall be found offending against the Act, and refusing to give name and place of abode, shall also be subject to a further penalty as provided by the Act. May I also take this opportunity of bringing to the notice of the readers of Science-Gossip, the Selborne Society, which has for its objects the preservation of our native fauna and flora, and is already doing some excellent work. The annual subscription is only 2*s.* 6*d.*, which also entitles members to copies of the Society's magazine, and all information can be obtained from J. L. Otter, Esq., 3 Dr. Johnson's Buildings, Temple.—*John R. B. Masefield, Rosehill, Cheadle, Staffordshire.*

Bombyx Rubi.—In reply to Mr. Finch and others, to the rearing of the above. I have bred it for a good number of years, and it has always proved very successful; generally breeding five or six out of every dozen of larvæ. Mr. Finch should get a good sized box, say 18 in. square and 12 in. deep, and put 3 in. of good mould into it, and place over it two square sods of grass with a few roots of narrow leaved plantain in it, then place the larvæ into the box, covered with wire gauze, and put it outside, so that they will get full exposed to the winter. I have never failed in the above. If kept indoors during the winter they will all die.—*Peter Kirk.*

Ducklings.—Last summer I had two broods of ducklings of eleven each. When two days old, the hens under whom they were hatched were placed in coops on my front lawn. The young ducks had their liberty to wander where they pleased, and when about nine days old, found their way down some steps into a pond close by. After swimming about for some time they returned, and attempted unsuccessfully to

mount the steps. Eventually they congregated together, held a consultation, and after a chorus of quacks started round a road to the back premises. I went through the house, and saw them come in a body under the gate into the yard. After looking around for a minute or two, they approached me in a body, held up their heads, and with a loud and united quack, led off to the door separating the yard from the garden. I followed them, and opened it, upon which they immediately took the right path round the house to the front lawn where the coops were placed.

FEEDING FROGS AND NEWTS. (SCIENCE-GOSSIP, p. 43).—I think A. F. Jenkins's frogs cannot be tree-frogs if they will eat worms, as he reports. I have kept tree-frogs, and they would never eat anything but insects and millipedes, the latter they were very fond of. The very name "tree-frog" suggests an arboreal residence, as of course they delight in, and where no worms could be obtained. Perhaps they eat worms for want of something better? I agree with your correspondent that it is cruelty to keep newts constantly in water; if required as ornaments in an aquarium they should always have a large piece of cork on which to scramble when they wish. With regard to salamanders, the best food for them is undoubtedly slugs, these creatures the salamander seems to be just able to overtake in their flight; other and more active prey, such as worms, etc., invariably make their escape whilst their enemy is making up his mind which to take.—*W. Finch, jun., Nottingham.*

FLIES AND ANTS.—"Amator Naturæ" has evidently witnessed the "Marriage Flight" of ants, which, according to White, of Selborne, takes place on hot sunny days of August and September. The larger winged ants are the females, those of less size the males. I have extracted the following from a paper by F. Buchanan White, M.D., F.L.S.: "When the winged individuals (male and female) leave the pupa state they remain in the nest for a few days, attended by the workers, but on some fine morning they come out, climb about the dome, or on some neighbouring plant and pair there, some however going off to a greater distance. At this time the workers are in a great state of excitement, and run hither and thither, looking for the fertilised females, which are then carried into the nest. The mates fly away, and, being unable to feed themselves, die in a few days, or are slain by birds or spiders, or by other ants. After a female has been fertilised she takes steps to get rid of her wings, which are now of no further use. This she accomplishes by moving them backwards and forwards and shaking them violently till they drop off. In getting rid of their wings they are often assisted by the workers. Thereafter the rest of the life of the female is spent in laying eggs from time to time, and she takes little or no part in the work of the nest."—*Thomas Winder, C.E., Sheffield.*

THE MOUNTAIN FINCH.—It is probably not very usual for this bird to roost in company with the house sparrow. During the last week in February, a large flock of these finches appeared at Hollybank, near Emsworth, of which several were taken in a sparrow net, among the evergreens. Some still (March 5) continue to stay in the neighbourhood.—*F. H. Arnold.*

MARINE COPEPOD.—The illustration representing a marine copepod with the young was found in the Menai Straits about the beginning of February. It shows in a striking manner the difference between the young nauplii and the mature crustacean. I am unacquainted with the name, and should be glad if any reader of SCIENCE-GOSSIP could identify it.—*Bernard Thomas.*

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.

MISS C.—The shell you sent us to be named is *Cyprea ocellata.* If you will send us your address (which has been mislaid) we shall be pleased to return the shell to you.

G. F., jun.—Your exchange was not inserted through inadvertence.

G. E. EAST, jun.—Have you tried preserving the delicate shells by placing them in a boiling mixture of milk and gelatine? It restores the organic matter and renders brittle shells hard; but much care must be taken.

J. BOWMAN.—We shall be very pleased to have your ornithological articles. Send us one to look at.

EXCHANGES.

WANTED, a set of the "Phytologist," in return for which will be given a collection of British mosses, in all about 350 species, named and localised, each species in separate packet; together with copy of Hobkirk's Synopsis.—J. C., 9 Wythenshaw Road, Sale.

FOR exchange, Witkowski's movable anatomical plates, seven in number, cost 7*s.* 6*d.* each, for Quain's "Anatomy," 8th or 9th edition, in good condition.—John L. Speirs, 1 Longley Street, Newcastle-on-Tyne.

WILL exchange "Cornhill Magazine" for 1886 and 1887, unbound, good condition, for good micro slides. Send list.—Miss P.—Fern Cottage, Witheridge, North Devon.

EXCHANGE.—*Planorbis glaber, Cochlicope tridens, Pisidium amnicum,* &c. Desiderata, *Bulimus montanus, Helix fusca, Helix obvoluta, Helix pygmæa.*—John Clegg, 5 Derby Street, Millwood, Todmorden, Yorkshire.

WANTED, Newman's "Moths," entomological apparatus, or ova, larvæ, or pupæ of Lepidoptera, in exchange for a number of educational books, "Tit-Bits," &c.—L., 4 Gill Street, Nottingham.

WANTED, in exchange for rare and curious lizard, about six inches in length, deep brown shining warty skin, found in eastern Perthshire, a live specimen of sea anemone, any of the trochus or turritella, or Velvet Fiddler crab.—Wm. Smith, Belmont Street, Newtyle, Forfarshire.

ABOUT fifty pathological slides in rack box, with class-room notes to most of them. What offers? Other micro-slides not wanted.—W. Mathie, 127 Buchanan Street, Glasgow.

WHAT offers for "Chambers's Encyclopædia," 10 vols.; Cassell's "Popular Educator," 3 vols.; Cassell's "Franco-Prussian War," 2 vols.; Ward & Lock's "Instruction for All," 3 vols., all bound half-calf, and equal to new, never having been used?—W. Mathie, 127 Buchanan Street, Glasgow.

FOR exchange.—Marshall's "Rural Economy of Southern Counties," 2 vols. (1799); "Burns's Correspondence" (1816); Forrest's "Rock Sculptures on Rombald's Moor" (lithographs, pamphlet); Harting's "Rambles in Search of Land Shells," and engravings of varieties of British Unios. Wanted.—Continental Unionidæ, or varieties of Helices, or varieties or monstrosities of *Dreissena polymorpha.*—Geo. Roberts, Lofthouse, Wakefield.

WANTED, a pond-collecting stick with bottle, net, knife, &c. Will give good exchange in micro-slides.—Geo. Ward, Syston, Leicester.

MOST brilliant and magnificent exotic butterflies—*Morpho anaxibia* and *Morpho leonte*—what offers?—Joseph Anderson, jun., Alre Villa, Chichester.

ANTIQUE microscope, "by Heath and Wing, near ye Exeter Exchange in ye Strand," supposed one of the first made, with

three objectives and other accessories, in mahogany case, all in good preservation. Would like to exchange for a modern serviceable microscope.—Ed. Lee, Havelock Cottage, Beach Road, Jersey.

Good exchange given for well-blown (side-blown) eggs. For further particulars apply to—W. M. Roberts, F.Sc.S., Abergynolwyn, R. S. O., Merionethshire, N.W.

Wanted, "Entomologist," Nos. 102–190, 193, 194, 196, 197, 220–223; "Entomologist's Magazine," Nos. 49–55, inclusive.—F. W. Frohawk, Balham, S.W.

To Egg Collectors.—I have a few coloured plates of egg of great auk.—F. W. Frohawk, Balham, S.W.

Wanted, British and foreign land and marine shells; good foreign stamps offered in exchange.—Thos. W. Reader, 171 Hemingford Road, London, N.

Wanted, a number of glass-capped boxes suitable for mounting delicate and small shells, &c.—Thos. W. Reader, 171 Hemingford Road, London, N.

Science-Gossip for 1886 in publisher's covers; ditto 1887 in half-calf, in perfect condition. What offers in photographic apparatus?—Geo. Fell, jun., Aylesbury.

Offered.—A good one-sixth objective, 110° aperture, shows beaded striæ on *Surirella gemma*. Wanted.—Kützing's "Species Algarum," and other works on algæ.—T. H. Buffham, Comely Bank Road, Walthamstow.

Unmounted objects in exchange for other unmounted or mounted objects.—Geo. T. Read, 87 Lordship Road, Stoke Newington, N.

Wanted, 1*s.* edition of J. G. Wood's "British Beetles." Good exchange in micro-slides or unmounted objects.—Geo. T. Read, 87 Lordship Road, Stoke Newington, N.

Wanted, a good and strong hand magnifying glass, also a flat micro aquarium; will give well-mounted slides in exchange.—A. E. Colman, 50 Elgin Crescent, Notting Hill, W.

Sponge spicules (mounted) from carboniferous limestone, in exchange for spicules or other fossils from other formations.—E. Carrick, Sharon Street, Dalry, Ayrshire, N.B.

Offered, "Universal Instructor," complete in 43 parts. Wanted, Horace B. Woodward's "Geology of England and Wales," 2nd edition.—J. Smith, Monkredding, Kilwinning.

Quantity of books (miscellaneous) in exchange for natural history books or specimens, or in part exchange for good microscope. Lists sent.—D. Lea, Dragon House, Farnworth, Widnes.

Helix cartusiana wanted in exchange for good British land and freshwater shells.—John R. B. Masefield, Rosehill, Cheadle, Staffordshire.

What offers for a duplicate volume of Science-Gossip for 1870, bound in the red paper (publisher's) binding?—E. H. Wagstaff, 3 Waterworks Road, Edgbaston, Birmingham.

Offered, really good telescope (cost 10*s.* 6*d.*), in exchange for good books.—Joe Bates, 20 Lord Street, Burnley.

Wanted, "Mounting and Preparing Objects" (Davies); "Pond Life" (Slack); "Hogg on the Microscope;" Huxley's "Biology." Will exchange scientific and educational works and fossils.—Jno. Eyre, 4 Kender Street, New Cross, S.E.

Genuine worked flints from Thames valley gravels; skull, dress, &c., of New Guinea native; skull of fallow deer; vols. of Science-Gossip, "Entomologist," and other good books, in exchange for micro-section cuttings, mounting apparatus, and dissecting instruments.—H. E. Quilter, 4 Cedar Road, Leicester.

Vol. I. of "Comparative Embryology," by F. M. Balfour, wanted.—H. E. Quilter, 4 Cedar Road, Leicester.

Advertiser, going to Australia, wishes to dispose of his collection of micro-slides. What offers?—Arthur Downes, 5 Royal Park Road, Clifton, Bristol.

Six dozen micro objects, well mounted on ground-edge slides, some professionally. Entomological books or apparatus required, or offers.—A. Draper, 179 Cemetery Road, Sheffield.

I will give two polished sections of unnamed and unlocalised Devonian fossil corals, for one specimen of any unpolished named and localised corals, except *Fenestella retiformis*, carb. and *Lithostrotion junceum*, carb.—Ernest O. Meyers, Richmond House, Hounslow, W.

Hawkins, "Ichthyosauri and Plesiosauri," folio, 30 plates, 1840. What offers in books?—P. Payne, Free Library, Hinckley.

H. cantiana and *H. virgata* in exchange for species of Vertigo and Pupa.—Chas. A. Whatmore, Ranelagh Road, Wolverhampton.

For exchange, a collection of about 1500 to 2000 fossils; also Science-Gossip (unbound), 1882–1885, inclusive.—J. A. Floyd, 15 Hospital Road, Bury St. Edmunds.

Offered, Science-Gossip from 1880 to 1887 (March parts for 1880 and 1885, and one coloured plate for 1884 wanting). Wanted, M'Coy's "Prodromus of the Palæontology of Victoria," decades I. VII.—J. Smith, Monkredding, Kilwinning.

Offered, Brachiopods and other carboniferous fossils. Wanted, fossils from other formations.—J. A. Hargreaves, Charlestown, Shipley, Yorkshire.

Wanted, all or any of Darwin's works; other books in exchange. List sent on application.—Miss C. Leigh, Stoneleigh Abbey, Kenilworth.

Specimens of minerals (40) in exchange for Darwin's "Descent of Man," and the "Origin of Species." Also minerals and fossils (chalk and coal measures) in exchange for mounted micro objects.—A. Richardson, 39 Edithna Street, Stockwell, London, S.W.

Duplicates.—*U. pictorum, D. polymorpha, B. leachii, P. corneus, P. vortex, P. spirorbis, L. stagnalis, L. peregra,* var. ovata, *H. pisana*. Wanted, *P. roseum, U. tumidus, P. carinatus, V. pellucida, Z. fulvus, H. lapicida, H. obvoluta.*—Henry C. Langdon, 4 Castle Down, Hastings, Sussex.

P. glaber for any other land and freshwater shells.—T. Ingham, 3 Railway Street, Darwen Terrace, Blackpool.

British land, freshwater, and marine shells, in exchange for any book or pamphlet by John Ruskin.—S. C. Cockerell, 5 Priory Road, Bedford Park, Chiswick, W.

Wanted, *Helix hortensis* and *H. nemoralis* from all parts of the British Isles.—Rev. J. W. Horsley, The Avenue, Bedford Park, Chiswick.

Wanted, exotic Lepidoptera and other insects; brilliant ones preferred. Microscopic objects offered in exchange.—J. W. Neville, Wellington Road, Handsworth, Birmingham.

Dragon-flies wanted from all parts of the British Isles, for purpose of working up geographical distribution; Lepidoptera offered in return.—W. Harcourt Bath, Ladywood, Birmingham.

Dragon-flies wanted. Offered, *A. adippe, G. rhamni, I. batis, L. argiolus, L. irretata, A. nebulosa,* and many others.—W. Harcourt Bath, Ladywood, Birmingham.

Wanted, micro-slides (especially botanical) in exchange for back numbers of "Popular Science Monthly," "Science Review," Science-Gossip, &c.; also D or C eye-piece wanted in exchange for A—difference arranged.—P., 80 Leathwaite Road, Clapham Common, London, S.W.

Botanist (young) desires a fellow one to accompany him on a collecting tour in beginning of July.—H. J., 69 Ramsden Road, Balham, London, S.W.

Wanted, numbers of Science-Gossip for 1883, except those of October and December. State desiderata.—A. G. H., 10 St. John's Hill, S.W.

What offers in old volumes of Science-Gossip, micro-slides of pond life or rock sections, for volumes of "Great Thoughts," "Cassell's Saturday Journal," a quantity of old "Graphics," and other magazines?—A. G. H., 10 St. John's Hill, S.W.

For exchange.—Science-Gossip, 1875–8, blue cloth, and thirty odd numbers; "British Butterflies," "Moths," "Entomology" (Kirby Spence), calf, gilt letters and edges, new; "Life of an Insect," 2 vols.; "Alphabet of Insects" (J. Rennie); "Insects" vol. of "Jardine's Naturalist's Library," coloured plates.—R. J. Warner, 80 Netherwood Road, Hammersmith.

"Illustrations of the Linnæan Orders of Insects" (W. Wood), 1821, 2 vols., 35 coloured plates, valued by "Bazaar" at 21*s.* Exchange for books on chess or singing, or anything useful.—R. J. Warner, 80 Netherwood Road, Hammersmith.

Offered, two years of "Knowledge," 1885–6, unbound; Muspratt's "Chemistry," unbound (incomplete). Wanted, works on dyeing.—Sellers, Deepdale, Davenport Park, Stockport.

For exchange, a number of Cambrian, Silurian, Devonian, and Oligocene fossils; also M'Alpine's "Zoological Atlas of Vertebrates" (249 figures), and "Zoological Atlas of Invertebrates" (231 figures). Wanted, Wood's or Duncan's "Natural History;" also fossils from formations other than the above, land and freshwater shells or micro-slides.—Theo. T. Groom, St. John's College, Cambridge.

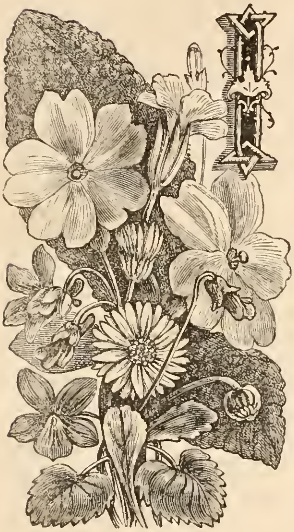
BOOKS, ETC., RECEIVED.

"Illustrated Manual of British Birds," Part I., by Howard Saunders.—"Trans. Leeds Geol. Association."—"Practical Geography for Schools," by Alfred Hughes (Oxford: Clarendon Press).—"The Story of Creation," by Ed. Clodd (London: Longmans).—Cassell's "Technical Educator," Part II.—"The Microscope."—"Journal of Conchology."—"Book Chat."—"Scribner's Monthly."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"The West American Scientist."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News."—"Wesley Naturalist."—"Naturalists' Monthly."—"La Science Illustrée," &c., &c.

Communications received up to the 14th ult. from: F. G. A. B.—W. H. H.—R. F.—A. G. H.—M. G. S. T.—S. H.—A. P.—J. H. H.—R.—H. F. R.—J. L. S.—J. E. N. B.—F. C.—A. T.—W.—R. G.—H. E. V.—G. T. F.—C. S. L.—G. H. W.—A. C. C.—A. H. S.—G. P. S.—S.—S. S. A.—G. L. A.—H. W.—G. J.—J. B.—G. R.—P.—W. H. L.—G. W.—J. A., jun.—R. H. N. B.—J. C.—J. L.—W. S.—W. E. C.—E. L.—W. M.—A. G. T. G. T., jun.—J. S.—E. C.—A E. C.—E. S.—I. H. B.—G. W. D.—G. T. R.—D. L.—I. W. R.—J. W. F.—J. R. B. M.—E. H. W.—W. M. R.—J. R.—E. O. M.—P. F. G.—A. D.—H. G.—J. W. N.—W. H. B.—H. C. L.—R. C. H.—P. P.—C. A. W.—J. A. F.—J. W. H.—S. C. C.—J. A. H.—A. R.—C. L.—A. D.—H. E. Q.—P. K.—H. T.—I. I. G.—J. C. E.—W. G.—I. S.—A. B.—S.—T. D. A. C.—M. E. S.—R. J. W.—&c.

THE COLOURS OF LEAVES AND FLOWERS.

By A. G. TANSLEY.



IN SCIENCE-GOSSIP for last October, appeared an article by Mr. G. W. Bulman, called "A Red Leaf—A Study in Botany," which I am surprised to see has passed entirely unchallenged; I should therefore like to offer a few remarks upon the subject.

In this article Mr. Bulman objects to "certain modern botanical theories" by which the colours of flowers are held to be developed through insect selection. His objection is based on the fact that, at various times of the year, leaves also develop brilliant colours. He remarks, very justly, that "we are just as much bound to account for the colours of these as of the varied hues of the blossoms," and he asks whether they can "be shown to be any distinct benefit to the plant in the struggle for existence."

He then goes on to attack a further development of the evolution of colour theory, viz., that special colours are evolved by, and together with, special insects; red and blue by bees and Lepidoptera, for instance. His grounds are (1) that (in his experience) there are certain red and blue flowers not visited by bees, and (2) that many flowers of various other colours are visited by these insects. Lastly, he cites two instances (the hawthorn and some Umbelliferæ) which he holds to be in contradiction to the "special colour" theory.

Mr. Bulman's objection to the general theory of colour development in flowers, is, I think, fully met by a quotation on the similarity of the coloured pigments found in leaves to those of flowers which Grant Allen ("Colours of Flowers," p. 20) makes from Dr. Sorby, the great investigator of the chemical nature of the coloured pigments found in plants. It is as follows:—

"The coloured substances in the petals are, in many cases, exactly the same as those in the foliage from which chlorophyll has disappeared; so that the petals are often exactly like leaves which have turned yellow and red in autumn, or the very yellow or red leaves of early spring." "The colour of many crimson, pink, and red flowers is due to the development of substances belonging to the erythrophyll group, and not unfrequently to exactly the same kind as that so often found in leaves. The facts seem to indicate, that these various substances may be due to an alteration of the normal constituents of leaves. So far as I have been able to ascertain, their development seems as if related to extra oxidisation, modified by light and other varying conditions not yet understood."

Clearly then, the development of the coloured pigments in both leaves and flowers is due to the same primary chemical set of causes; but, while more or less accidental (being "modified by light and other varying conditions not yet understood,") in the case of leaves, in flowers the colours are stereotyped and perpetuated by insect selection. To Mr. Bulman's question, therefore, as to whether the colours of leaves can "be shown to be any distinct benefit to the plant in the struggle for existence," I would answer decidedly in the negative; if the colours were any distinct benefit to the plant in the struggle, natural selection would have seized upon and fostered this peculiarity, and it would have become permanent, instead of remaining a simple chemical outcome of certain processes which take place in leaves in the absence of chlorophyll, and subject to modification by "light and other varying conditions."

Mr. Bulman further asks, why bees do not visit brilliantly coloured leaves as if they were flowers. The reason appears simple enough. If they ever do visit them, they would soon find that there is nothing

to be got. Undoubtedly bees would not continue to visit flowers simply because they possess attractive colours. They require, as Sir John Lubbock points out, much more substantial inducements.

Secondly, with regard to Mr. Bulman's attack on the theory, that special colours are developed by special insects; red and blue by bees, for instance.

In the first place, the experiments of Sir John Lubbock which Mr. Bulman mentions, were not intended to prove that theory at all. In Sir John's notice of them in his "British Wild Flowers in relation to Insects" (p. 12), he does not even mention red or blue as the colours chosen. The experiments were of course intended to show that bees can remember, and therefore distinguish, individual colours. These experiments are recorded at length in "Ants, Bees, and Wasps" (*International Scientific Series*), pp. 291–302. Another set of experiments, recorded in the same volume, pp. 303–307, do certainly show the preference of bees for honey placed on blue paper; and although Mr. Bulman considers it "more philosophical and conclusive" to study the habits of bees with regard to flowers themselves, I would ask why bees so greatly prefer honey on blue paper, if not because they prefer the colour blue in flowers?

At any rate, whether bees prefer blue and red to other colours or not, I suppose no one has ever asserted that they do so in an æsthetic sense. The contention of the upholders of this theory is rather that they have learned to consider blue or red as an index of high specialisation; and therefore of flowers, which, while presenting peculiar adaptations for their visits, in many cases exclude (by the length of their tubes, etc.) other insects, except of course Lepidoptera; that red and blue are in fact highly-evolved colours, consequently present in highly-evolved flowers which are fitted for the visits of highly-evolved insects.

To make this point more clear, it may be as well here to mention some important conclusions of Hermann Müller, and Grant Allen. Almost the last words of Müller's great work, "Die Befruchtung der Blumen," are:—

"On the whole we find red, violet, and blue colours appearing for the first time in flowers whose honey is quite concealed and which are visited by more or less long-tongued insects (bees, long-tongued flies, Lepidoptera), or else in flowers visited for the sake of their pollen chiefly by bees and drone-flies (*Hepatica triloba*, *Verbascum phœniceum*)."

Grant Allen shows a remarkable accordance with this view, which is all the more striking because his work is on such entirely different lines; his object being to account for the colours of flowers, while Müller's is to explain their mechanisms in relation to their insect visitors. In summing up his "Law of Progressive Colouration," he comes to six conclusions; the three bearing on this point are:—

(1). The most advanced members of all families are usually red, purple, or blue.

(2). Almost all the members of the most advanced families are purple or blue.

(3). The most advanced members of the most advanced families are almost always blue, unless spotted or variegated.

N.B. The qualifying words, "usually," "almost," are accounted for by his theory of "retrogression."

Now Grant Allen here designates by the word "advanced" precisely those species which have become so specialised, that their honey is inaccessible to any insects except bees, Lepidoptera, etc.

Grant Allen's theory of colour development, as expressed in his "Colours of Flowers," can hardly be accepted in its entirety. Much of it undoubtedly requires further proof, and much is unlikely on general scientific grounds; but however much or little of it we accept, his accordance with Müller on these points is worth noticing.

As to Mr. Bulman's first objection to this theory, viz. that certain blue and red flowers are seldom or never visited by bees, I do not think the facts support him.

Personally, I have not systematically observed the visits of insects to flowers; but his observations on two or three of the red and blue flowers mentioned by him as seldom or never visited by bees are not supported by those of Hermann Müller, recorded in his "Befruchtung der Blumen," of the patience and care of which I need hardly speak. These two or three (the common poppy and the periwinkles) are the only native German flowers (except the *Scillas*) in Mr. Bulman's list, and therefore the only ones recorded in Müller's work.

Of these, the common poppy (*Papaver Rhœas*) has been observed by Müller to be visited by seven species of bees, and only three species of all other kinds of insects.

Vinca minor has a similar record, viz. bees, seven; other kinds of insects, three.

On *Vinca major* Müller has observed only *Bombus agrorum*.

Mr. Bulman's second ground of objection to this theory is that bees often visit flowers of other colours than red or blue. This no one will deny. Indeed Hermann Müller in his "Befruchtung" comes to the conclusion, that "the study of particular species of insects confirms the conclusion based on observation of the more conspicuous flowers, that in general anthophilous insects are not confined by hereditary instinct to certain flowers, but fly about seeking their food on whatever flowers they can find it."

I think, in fact, we may safely conclude that while red and blue, appearing as they do in flowers highly developed in other respects, were evolved through the selective action of long-tongued insects such as bees and diurnal Lepidoptera, by which they are in many cases almost exclusively visited, on the other

hand flowers of other colours possessing great conspicuousness with or without odour (white clover, pear blossom, yellow crocus, dandelion, tropæolum, willows), or a powerful odour with or without a certain degree of conspicuousness lime-tree, mignonette), combined with large quantities of easily accessible honey or pollen or both, attract large numbers of insects of very various orders, among which are many bees. To this category, as will be seen, belong all Mr. Bulman's list of "white, yellow, and greenish flowers" "much frequented" by bees, and, as he truly says, "a host of others might be mentioned."

With regard to the two instances (hawthorn and some "Umbelliferæ"), which Mr. Bulman seems to think contradict the "special colour" theory, I have only to say, that the first case is in accordance with Grant Allen's "Law of Progressive Colouration," and the red variety ought certainly, according to his view, *cæteris paribus*, to attract the higher kinds of insects more than the white one. But surely Mr. Bulman's remark, that our "gardening friends" would "probably" tell us that insects are attracted "not nearly so well" by it, is rather poor argument.

The "decided shade of pink" which some umbelliferous plants have "before expanding" is more important. It is perhaps analogous to the case of *Phlox* mentioned in "Colours of Flowers" (p. 115), which changes from blue to pink during the day. "It has been suggested that this is due to the presence of some substance which becomes blue by non-elimination of oxygen during the night; and as the oxygen is given out during the day, the blue colour disappears." Just in the same way, the pink colour in the umbellifers may be due to presence of oxygen, which is given off as the flower opens. But because certain colours exist, as the results of chemical action, where by the very circumstances of the case they cannot be influenced by insect selection, surely it is unwise to argue that the colours of flowers in general are not produced by insect selection.

"RUDIMENTS AND VESTIGES."

Do not let us dishonour the memory of the great master, Charles Darwin, by useless quibbles over a possible construction to be placed upon his words.

The drift and meaning of his writing and that which he wished to teach is understood by those who wish to understand it; therefore we need not waste time and patience by useless argument.

A word or two anent N. F. L.'s last "Reply." The state indicated by the word "perfection" is relative only, as Mr. Fenn pointed out—a creature is relatively perfect for the position it occupies; but, as Mr. Fenn says, that is not saying that it is incapable of further advances in the direction of improvement. Creatures alter, nay (so called) species alter; see a recent paragraph by our old friend Mr. Mattieu Williams in the March number of SCIENCE-GOSSIP, "The Mutability of Species;" each was perfect for its environment in its day (Mr. Fenn).

I cannot consider that we are put into a "strange position" in having to seek for the highest development of a given organ, anywhere.

Surely it is not needful, in these days, to demonstrate again that the senses of sight, hearing, and smell, in man are inherited in an enfeebled and vestigial condition, as also are the teeth, lungs, and down, of his body.

It is absurd to import into the question the phenomena belonging to the mind.

What avails it to prove the question of sight to place a bird in a picture gallery? Put it in its own sphere, will N. F. L. say that the sight of man can compare with it? The emotions have nothing at all to do with the capacity of the visual organ.

Again, "refinement" need not be introduced; yet who shall say that the power of the hound to separate from all disturbing influences, the odour that his heart is set upon, is not refinement of sense? Can man do this? And if the dog hears sounds "unperceived by us," surely this shows that his sense of hearing is better than ours, and serves him to better purpose.

The emotions evolved in the higher mental development of man, do not find scope in the less developed mental states of other vertebrates; they have even a limited field in mankind. Would a Bosjesman, a Digger Indian, or a native of Tierra del Fuego receive the full possibilities of intellectual entertainment in a picture gallery or at an oratorio?

Observe the delicacy of sight and smell in the bee, that lead it to select, among an array of blooms, the species that it first starts to plunder of its sweets in the morning and to keep to it during its work, and to return from flowery fields afar to its hive, though it be a house among many houses all alike to our seeming.

Is the sight of man equal to that of the eagle or cat? His sense of smell to that of the flies, the Felinæ or Caninæ?—or his hearing to either of the two latter?—his teeth to those of the ancient races? What shall we say of the sense that enables birds of prey to swoop down from the empyrean, where a moment before not a speck was visible, upon the fainting life of a dying animal, or the burying beetles to come suddenly from the heights of air to the carcase of a dead bird or frog? which brings the male emperor moths to play round the box wherein a female is imprisoned, in troops, where, unless she were present, few would be seen?

It is a fair and reasonable deduction to assume that the down on the body of man is a vestige. When man emerged from the less to the higher intellectual life—very slowly was it brought about—his gregarious habits, and acquired methods of shelter, rendered the

hair upon his body less necessary, and it became irksome to him and in time came to be looked upon as not ornamental; the bold and handsome contour of the limbs showed with a greater attraction to the gentle sex when less covered by hair; hence, by a process of "natural selection," he has lost it. The tail disappeared from the same cause doubtless, as a useless, unornamental, and unnecessary appendage.

Verily, N. F. L., we must not be arrogant. The loving student stands at the portals of a palace whose beauties and marvels awe him into humbleness. Rather may he say, "how great am I and yet how small!" how much am I indebted to these my kinsmen in the great kosmos for that I possess, yet how little do I comprehend the complex laws and diverse capacities which enable them to maintain their existence, equally with me, against the adverse elements which war continually against us; and while reverently enjoying the feast of intellectuality which my higher mental development enables me to enjoy, let me give to each its due, and not pharisaically cast aside as of less import than myself the grand evolutions brought about by the travail of the ages. T.

A CURIOUS CREATURE.

BALANOGLOSSUS SARNIENSIS.

THE following notes on this, the largest known representative of its curious genus, may be of interest to the readers of SCIENCE-GOSSIP.

This species is at the very least a score of times larger than any of its brethren, and possesses the additional interest of being an inhabitant of the English Channel.

It was first recorded by my friend Dr. René Kœhler of the "Faculté des Sciences" of Nancy, from portions found by him on the shores of the Island of Herm, in the autumn of 1885; and his notes on it as well as a figure, are published in the "Annales des Sciences Naturelles" of that year. But the figure, I am sorry to say is not perfect, he not having had the good fortune to find the posterior portion of the animal, and having spirited his specimens before sketching them some of the structural detail is lost.

Since his discovery, I have frequently, in the same locality, unearthed portions of this animal from four to eight inches long, and, on one occasion only, an entire specimen. It is from this last that my figure and the following description are taken. This was a large specimen, but judging from some fragments that I have come across not exceptionally so.

Its length when fully extended was thirty-five inches, and its diameter, that shown in the figure, *i.e.*, about three-eighths of an inch.

Its colouring was as follows. The anterior portion or "branchio-genital region," extending for about eight inches, of a beautiful orange yellow; then on the "hepatic region," a space of about four or five inches, this gave place rather abruptly to a rich chestnut brown; this now passing through shades of olive to a deep green for the whole length of the digestive canal ("Tube digestif," Kœh.), beyond this a creamy, and finally almost transparent white.

The texture of the animal is rather difficult to define in terms usually applied to tissues, that of the "branchio-genital" part being of a consistency not unlike soaked bread, and might be called "pulpy friable." The hepatic region rather more gelatinous.

The next part, the green "tube digestif," is little more than a roll of the sand which the animal has

Fig. 49.—Middle and posterior parts of *Balanoglossus sarniensis,* Kœh. (not continuous). Drawn from living specimens by J. Sinel.

swallowed invested with a skin and membrane so thin and delicate that a portion, say four inches long, has not sufficient cohesion to maintain its weight if lifted by one end.

The last six or seven inches are free from sand and gelatinous.

The animal exudes a thick mucus which invests it in a kind of web, especially around the anterior part, and from which it may be drawn as from an incipient tube. So rapidly is this mucus exuded, that during the brief time that my specimen posed as model in a dinner plate of sea-water I had to clear it at least a dozen times. The animal emits a peculiar and by

no means disagreeable odour; unlike anything and everything else except "iodoform," which it resembles precisely. This odour is very tenacious, specimens that have been in four or five changes of alcohol still retaining it strongly, while on the hand that has touched either the animal or its mucus it will resist hot water and Pears' soap to the third and fourth application.

On the subject of its internal anatomy I am not biologist enough to enter. The smaller species are worked up in full detail in Huxley, Claus, and other text books on invertebrate zoology, and the particulars of these apply no doubt to the species before us as well; but the following details of its outward form may be of interest.

The proboscis, when at rest is of the form shown in the figure, and is not retractile; on the other hand it can be extended to double this length, not by a process of eversion, as in the Nemerteans and Annelids, but by simple elongation, until it assumes a tapered point. In section, the anterior portion is broadly triangulate, the lateral angles forming very soft and pliable lobes which sometimes irregularly fold over the dorsal side until they meet.

Medially—on both dorsal and ventral sides—there runs a delicate thread, which appears, especially on the dorsal side, to be at a much greater tension than the rest of the structure, causing the lateral lobes to assume a somewhat waved or "puckered" arrangement.

From the hepatic region to within six or seven inches of the anal extremity the section is subcylindrical, and here gradually the medial threads become nearly obsolete, being only traceable as very fine lines. Here also the transverse "crenation," (or "pseudo-segmentation," if I may invent a term) becomes irregular and assumes a kind of basket-work pattern.

Beyond this, and on the part that I have mentioned as free from sand and gelatinous, the threads again appear, that on the dorsal side deeply sunk in a groove giving the section at this part as oval, with a deep emargination on one side, and the transverse "crenation" again becomes regular, each line being traceable on the whole circumference.

Referring again to colour, I have found some specimens in which the anterior part was of a lemon colour, and others of a brick red; but the brown, green, and creamy white parts I have not found to vary.

Of its habits I am not prepared to say anything, they seem to be altogether of a passive description. Limp and apparently almost lifeless, it makes no expression of the emotions when turned out of its home, nor even when put into a jar of spirits of wine.

Of great length and extreme tenderness, it is a puzzle to me how it maintains its integrity if it travels at all, among the sharp sand and broken shell amidst which it dwells.

That it does not habitually come to the surface of the sand is plain, for on the surface no marks are seen except such as are clearly traceable to the Synaptæ and Euniceæ, who are its congeners. Dr. Kœhler also mentions that he has sought in vain for any mark that would indicate its burrow.

No doubt the majority of the readers of SCIENCE-GOSSIP are aware of the interest that centres around the curious genus "Balanoglossus," and how, regarding its place in nature, the doctors disagree.

How embryology, "ever the surest guide," relegates it in turn to the Echinoderms, the Molluscs and the Tunicates, while, to crown the complication, Balanoglossus in adult life assumes an annelidan form but couples with it "gill clefts" and other details that pertain by right only to embryo vertebrates. The inference from this is well explained in the following quotation from Wilson's "Chapters on Evolution":—

"There seems little reason to doubt that this curious animal is a survival of a once widely represented type which to-day exhibits decline and decay whilst preserving for us the important characters of a common ancestor of several existing groups of animals."

J. SINEL.

Jersey, April 16th, 1888.

NOTES ON NEW BOOKS.

OTHER SUNS THAN OURS, by R. A. Proctor (London: W. H. Allen & Co.). This is, perhaps, the best series of "Essays on Popular Astronomy" Mr. Proctor has yet issued, which is saying a good deal. They are all written in the polished, terse, and yet lucid English of which Mr. Proctor is master; and they set forth in a delightful manner the newest information and generalisations on leading astronomical and correlated subjects. The leading chapters are devoted to "The New Star in Andromeda," "The Birth of Worlds," "William Herschel's Star Surveys," "Photographing Fifteen Million Stars," "Figure of the Milky Way in Space," "The Sidereal System Fathomless," "Suns and Meteors," "Comets and Meteors," "Whence came the Comets," "A New Theory of Sun-spots," "Two Sun-like Planets," "The Great Red Spot on Jupiter," "A Dead World," "A Zone of Worlds," "Saturn and its System," &c.

The Story of Creation, by Edward Clodd (London: Longmans). Another of Mr. Clodd's charming treatises—rather summaries—of what the scientific and philosophical world is doing and thinking about. To intelligent men of business, scholars, and others who have not sufficient leisure to undertake the enormous labour of wading through the literature of the Theory of Evolution, this book comes as a godsend. In a brief and handy compass we have a complete exposition of that theory. The laws of the

inorganic and the organic world are explained with remarkable simplicity. Even scientific men, who have already done Darwin and Spencer, will be thankful to Mr. Clodd for enabling them at any time to rapidly go over the old ground again.

Holiday Letters of a Geologist, by James Shipman (Nottingham: Carrick & Young). The author is a well-known and diligent field geologist, who herein shows that he can not only work well but write well. They are genuine "holiday letters," and have the fresh and joyous flavour of holiday time about them. Intending ramblers in North Wales, the Isle of Man, the Norfolk coasts, and the southern coasts of England, should forthwith procure Mr. Shipman's book.

The Flora of West Yorkshire, by F. A. Lees (London: Lovell Reeve & Co.). A bulky, handsome volume, the result of years of labour, by one of the most diligent, capable, and painstaking labourers in the botanical field. The above work gives a sketch of the climate of the West Riding of Yorkshire, and shows the limits imposed by its various factors upon the flora. It also connects the facts concerning soils and rocks, in respect to their behaviour under disintegration, with the plant-life. Lastly, it furnishes to students and collectors a list of all the species found in the Riding, which is not merely a guide to the localities where they grow, but a history of each species as well. Dr. Lee's appendices are as valuable as the general text. The above work is one of the best of its kind which have yet appeared.

A Flora of Hertfordshire, by the late A. R. Pryor (London: Gurney & Jackson, successors to Van Voorst). The late admirable and indefatigable author of this large and important volume was a frequent contributor to our magazine. It was well known that he had been at work on the subject for some time, and perhaps there is not a county in England (except Sussex) with such a varied flora as Hertfordshire. When Mr. Pryor died, his MS. was bequeathed to the vigorous and growing Natural History Society for the county. After waiting some time, the work was edited by Mr. B. D. Jackson; and Mr. John Hopkinson wrote an introduction on the Geology, Climate, and Botanical history of the county. The result is a most valuable work, both to the county and country at large. There is prefixed a very useful map of Hertfordshire, showing its river basins as adapted for botanical districts, each river-basin having a district elevation and a geological sketch map of the superficial geology, which is that most influential on the distribution of plant life. Mr. Hopkinson's preliminary essay is a model of its kind for completeness, grasp, and generalisation. Of the late Mr. Pryor's labours it is impossible to speak too highly. This very work shows that no honest worker lives in vain.

Notes on the Birds of Herefordshire, by Dr. H. G. Bull (London: Hamilton & Adams). This handsome volume contains the notes which the late genial Dr. Bull was wont to read at the Field meetings of the Woolhope Club. The members were in the habit of increasing their ornithological importance by contributing their own observations. When they had assumed a somewhat bulky importance, Dr. Bull thought of publishing them, but died before he could do so. The members of the Woolhope Club have therefore carried out Dr. Bull's intentions, and have generously published the work under his name. Like all bird-books, it is delightful reading; but we would suggest there is too much "poetry" in it, as much of quotations from the poets as is nearly equal to the "Notes." Phil Robinson has done that sort of thing so much better in his "Poet's Birds."

The Creator and What we may know of the Method of Creation, by the Rev. Dr. Dallinger (London: T. Woolmer). For twenty years past, in the teeth of opposition, we have contended that the doctrine of Evolution, instead of being atheistic or even agnostic in its tendencies, was a distinct gain in one's reverent comprehension of God. Those who fear the opposite should read the present work, by one of the most distinguished scientists of the day, as well as one of the most ardent evolutionists. Dr. Dallinger is a Wesleyan Divine (or, as he would doubtless prefer to be called, a Methodist parson); and this nicely got up brochure is the "Fernley Lecture," delivered before the Wesleyan Conference last year. It is simply a fine and eloquent pleading before the Fathers of his church for the new philosophy.

The Microscope in Theory and Practice, by Professor Naegli and Professor Schwendener (London: Swan Sonnenschein & Co.). The names attached to this volume are high guarantee for good work. It is a wonder its translation has not been attempted before, and we are indebted chiefly to Messrs. Crisp and J. Mayall, of the Royal Microscopical Society, for its present appearance. To advanced workers, this volume is indispensable. Everything connected with the microscope, optical, mechanical testing, technical, etc., is here contained. It is a Microscopical Encyclopædia, in short.

Bees and Bee-Keeping; Scientific and Practical, by F. R. Cheshire (London: L. Upcott Gill). This is the second volume of Mr. Cheshire's thoroughly exhaustive work on the subject. We duly noticed the first when it appeared. It will be a long time before another work, of such a thorough character, will be issued on the subject. Mr. Cheshire has left no wind for anybody else's sails. This second volume is entitled "Practical," and deals with the management of bees, their hives, control, artificial aids, controlled increase, raising, etc., of queens, production of honey, wintering, diseases, races, etc.

Lectures on Bacteria, by A. De Bary (Oxford: Clarendon Press). This is a translation of the second edition of the famous lectures of the Strassburg Professor, done by Mr. H. E. F. Garnsey, and

revised by Professor J. B. Balfour. Its chief aim is to set forth the known facts in the life of bacteria in connection with those with which we are acquainted in other branches of natural history. The student of bacteria could not find a shorter synopsis of the bacteria, nor of their habits, life-history, etc., than in this small volume.

A Dictionary of Place-Names, Giving their Derivations, by C. Blackie (London : John Murray). At first sight, a book like this seems to have nothing to do with natural history. There a person would be mistaken. The names of many places enshrine the ancient physical and geographical conditions which do not exist to-day. From this point, the subject is comparatively unworked. From the historic point of view, it has been fairly thrashed out by Canon Taylor, Professor Joyce, and others. To intellectual tourists the names of places may possess an additional interest. Mr. Blackie has done excellently, and Professor Blackie has done well to the book (as well as the author, we suppose) by a charming "Introduction" to a subject no man loved better or worked better. Intelligent Scottish and Welsh tourists, please get this volume, and put it in your knapsacks.

The Shell Collectors' Manual, by J. W. Williams (London : Roper and Drowley). Perhaps there was no practical work more needed for students than this. The rule in natural history (so far as we know, after nearly twenty years' practical experience) is that the supply of information is greater than the demand. In a few instances, this is not the case ; and Dr. Williams is one of the few fortunate ones who has brought out a cheap, thoroughly good, and even attractive handbook, which can hardly fail to be highly appreciated.

A Manual of Elementary Microscopical Manipulation, by T. Charters White (London : Roper and Drowley). It is pleasant to find we have nailed Mr. White at last. Nobody likes a bit of fun more than he ; and he doubtless enjoyed our ascription of microscopical authorship to him, a few months ago, amazingly. We had to recant—as all honest men have (rogues never do !). But is it not funny that Mr. White should bring out a charming and altogether most useful and necessary little book like the present, just after we had lachrymally expressed our regret at supposing he was an author? Never mind all that. This is just the book for young amateur microscopists to order of their booksellers immediately.

Living Lights, by Chas. F. Holder (London : Sampson Low). A beautifully got up volume, abundantly and artistically illustrated ; useful to the naturalist as containing a summary of all the animals and plants which give out phosphorescence in any shape or form.

Ants, Bees, Dragon-flies, Earwigs, Crickets, and Flies, by W. Harcourt Bath.

British Birds, by W. Harcourt Bath.

Silkworms, by E. A. Butler (London : Swan Sonnenschein & Co). These are issues of the familiar "Young Collectors' series." Mr. H. Bath's "Dragon-flies," &c., will be especially welcomed ; and all are good and cheap (one shilling each).

Practical Geography for Schools, by Alfred Hughes (Oxford : Clarendon Press). A new and important method of teaching the subject, based on nine years' trial at the Manchester Grammar School.

A Treatise on Hydro-dynamics, by A. B. Basset, Vol. 1 (Cambridge : Deighton, Bell, & Co.). Only that our pages are devoted chiefly to natural history subjects, we should have liked to dwell more extensively on the merits of this work to students of the subject. Suffice it to say, that possibly there is not a more exhaustive manual before the public.

Elementary Text-Book of Physiography, by W. Mawer (London : John Marshall). A handy, succinct, and trustworthy little manual.

Photography Simplified (London : Mawson & Swan). This is the third edition of a thoroughly practical treatise on the subject, for the use either of professionals or amateurs. It contains useful hints to beginners on the selection of apparatus, and on general practice.

The Medical Annual, 1888 (Bristol : John Wright & Co.). The enlarged bulk of this annual is sufficient to indicate its practical success. It is now really a work of reference to medical practitioners generally, and contains essays on special subjects by a host of recognised specialists, besides most useful summaries of progress in treatment, pharmacy, etc.

Year Book of the Scientific and Learned Societies of Great Britain and Ireland, fifth annual issue (London : Charles Griffin & Co.). This work becomes increasingly useful and necessary with every yearly volume.

Geology, by Dr. Page, revised by Dr. Charles Lapworth, 12th edition (Wm. Blackwood & Sons). This is really Lapworth's book, and not Page's, which is a good job ; and we hope the publishers will acknowledge the metamorphosed authorship in the next edition. In its present form there is nothing better in elementary geological literature.

Introductory Text-Book to Zoology, by Dr. H. A. Nicholson (Wm. Blackwood). This is the sixth edition, revised and enlarged, of an elementary manual of zoology than which we have seen nothing better in Great Britain the last fifteen years.

OBSERVATIONS ON THE *UNIONIDÆ*.

DURING the years 1886 and 1887 I was enabled, by means of exchange and otherwise, to examine a considerable number of specimens of Anodons and Unios from different localities. The study of this group is very perplexing, owing to there being so much variation in the form of the shells, so much in fact that every British author seems to have taken a different view of what is a species or a variety.

And further, authors appear to be at variance in considering what forms are types, especially in regard to the Anodons. Brown (1845) and Tate (1866) have each represented a form of *A. cygnea* which I believe is generally considered as the type, but Gray (1840, frontispiece) has given a figure of a form of the so-called *Zellensis*. I have seen the variety which is represented by Gray's figure from two or three places, but it does not seem to be as common as the larger forms of *Zellensis*. Judging from the number examined there seem to be three forms of *A. cygnea* that are common. These, in the order of frequency, are (1) *Zellensis*, Genel; (2) type of Brown and Tate, and (3) the form called *rostrata*; but between these, and approaching one or the other, there are numerous intermediates, which cannot with certainty be classed under any of the recognised forms. The variety called *intermedia*, figured by Brown, is more allied to *cygnea* than to *anatina*. Mr. Rhodes, an industrious Bradford collector, sent me a number of this variety from a pond at Pudsey, near Leeds. I also got it from the Rev. W. C. Hey, of York. The York shells are very thin, agreeing with Brown's description. The Pudsey shells are rather thicker and variable in size and degree of inflation. Both are green, the Pudsey shells being very bright and beautifully rayed. Alder considered that this should be regarded as a species; Jeffreys does not mention it. I also had this form sent from Staffordshire by Mr. J. R. B. Masefield, of Cheadle, but the shell is a degree thicker than the Pudsey specimens. Amongst Mr. Rhodes' shells is a remarkable subtriangular form of *intermedia*. The nucleus is nearly in the middle of the upper margin, which slopes upwards from before and behind —the hinge forming the apex of the triangle. Another specimen has the valves unequal in length. This variety, species, or what it is, seems to live at times rather deep in the mud. In a letter, under date May 7, 1887, Mr. Rhodes says: "The enclosed shells now sent were obtained from a storage dam which is 4 feet deep in soft mud. I find them about 8 inches from the surface. There is about one foot of water and no vegetation. The dam is well shaded with trees. I obtained them by taking off boots and going in, sinking at each step up to the knees in mud. I had to put my arm up to the elbow in water and mud to get the shells, and had to keep constantly walking or otherwise I should have stuck fast." Under date July 5th, he again writes: "The shells keep very deep in the mud from 6 to 12 inches down, so that they can only be got by going in knee deep in the sludge and looking for the little holes and depressions which indicate where they are." The average size of *intermedia* may be about $2\frac{1}{2}$ inches from hinge to lower margin, 4 inches from side to side, and $1\frac{3}{8}$ thick.

In the Leeds and Liverpool canal, varieties of *Anodonta*, both species, occur, which are brown in colour, small, and not rayed. I imagined that exposure in dredge heaps, and lying dead in the mud for some time, might change the colour of the epidermis, but Mr. J. A. Hargreaves, of Shipley, near Bradford, who collected some hundreds of specimens, and who is an excellent observer, informs me that such is not the case, neither does scalding of either dead or living specimens affect in any way the colour. Many of the shells, however, Mr. Hargreaves says, are green when young. Many of the canal shells are characterised by being much compressed. Some that are $3\frac{1}{2}$ inches in breadth, more than 2 inches in length from beak to margin, are less than 1 inch in depth or thickness. In these the animal is exceedingly small. The largest brown shells are $5\frac{3}{10}$ inches in breadth and $3\frac{1}{2}$ inches in length. One specimen of *Anodonta anatina* var. *complanata*, collected by Mr. Hargreaves, contained a pearl of a yellow colour about half the size of a pea. A monstrosity of *A. cygnea* var. *rostrata* was collected by Mr. Rhodes from a pond. The edges of the valves on the lower margin are folded inwards for a certain distance, and the posterior side of the shell is much pinched in at the extremity. About twenty specimens of this deformity were collected. The shell appears to be normal up to the last period of growth.

So far as I have been able to observe, the green forms of *A. cygnea* run larger than the brown forms, irrespective of locality. Some of the Bradford shells are nearly black, and some that I have from a pond at Rothwell Haigh, near Leeds, are of a dark slaty blue colour, white on the umbones, smooth, shining and faintly rayed.

The form called by Jeffreys *Anodonta anatina* var. *complanata*, should, in my opinion, be raised to the rank of a species. The hinge-line is not elevated into a thin sharp wing, the shell is not angulated in any part of its outline as is typical *anatina*, and it is brown in colour. The varieties *radiata* should be suppressed, as rays of different kinds are common to both species, and to many varieties, and are found on shells of all sizes and colours, and from all localities, being in short a part of the ordinary colouring. Rays are most strongly marked on green shells. The variety *intermedia* (Pfeiffer) should be introduced into our handbooks, and made to comprehend Brown's *subrhombea*, to which it appears to be closely allied. The variety *pallida*, recorded by Jeffreys from the West coast of Ireland, seems to be rare. I have only once seen it mentioned in local lists, and that was in a Birmingham list by Mr. Sherriff Tye. I have it from Mr. Masefield, who got it in Staffordshire, and from the Leeds and Barnsley canal procured by Mr. J. Wilcock. Mr. Masefield's is of a clear fawn colour, *Zellensis* in form.

The greatest difficulty in the study of the *Unionidæ* is with young shells and with the numerous intermediate forms. Jeffreys kept altering his views as he became more and more acquainted with the subject, and so will any one else that has continued

any length of time in the study, for new forms are continually turning up which have a tendency more or less to upset settled decisions. I should recommend any one who may have a number of dubious forms, which cannot be referred to any marked and established variety, to simply put them on one side in a drawer, and label them as intermediates, adding locality, whether from pond or running water, with date or other circumstances. I have tried hard to discover some means of knowing when a shell is mature, but have failed. I think, however, when a shell shows more than twelve principal growth lines, it is approaching maturity. These lines in *A. cygnea* are generally raised into ridges, and some shells exhibit forty or fifty, not reckoning the finer secondary lines which are smooth. In *A. anatina* (full grown) smooth spaces without ridges or lines are considered to be distinctive of the species. But there is great discrepancy in the descriptions of Anodons by British authors, for instance Macgillivray says that the shell of *A. anatina* is very thin and brittle, whilst Tate says it is thick. The same with illustrations, Jeffreys has figured a shell on plate ii. (British Conchology) which is named *A. anatina*, but Gray has figured a very similar form (p. 288, "Manual," 1840) which is called *Anodon cygneus*.

A few notes on *Unio tumidus* and *pictorum* are reserved for a future number.

GEO. ROBERTS.

Lofthouse, Wakefield.

THE PLIOCENE BEDS OF CORNWALL.

PROBABLY the most important discovery in English stratigraphical geology, within the last few years, is that of a deposit of Pliocene age, at St. Erth in Cornwall, far distant from the typical crag areas. A résumé of its more important features may be of interest to the readers of this magazine.

St. Erth is a village of between two and three thousand inhabitants, three and a half miles south-east of St. Ives, and two miles south-west of Hayle. The deposit was first noticed by Mr. N. Whitley,* of Truro, who however referred it to the Glacial period. But the first detailed account of it was given by the late Mr. S. V. Wood,† who referred it to the Pliocene period, which has since been confirmed.

The deposit is exposed in a pit near the Vicarage, where the beds shown in the accompanying section (Fig. 50) may be seen. The "head" is a clay with fragments of various rocks, most likely a glacial deposit. "Growder" is a coarse ferruginous sand. The blue clay is the most important bed, as it contains a large number of well-preserved fossils. The yellow clay above may be only a weathered part of the lower deposit. The whole area of the deposit is less than an acre, so that it is perhaps scarcely to be wondered that it was not discovered before. The shells being preserved in a clay present a very different appearance to the crag fossils, and, indeed, so resemble those found in the eocene clays, that at first one feels inclined to place them in that formation; but an examination of the species soon dispels this idea.

The following is a list of the more important forms:—*Fusus corneus*, Lin.; *Columbella sulcata*, Sow.; *Nassa serrata*, Broc.; *N. granulata*, Sow.; *Cypræa avellana*, Sow.; *Natica millepunctata*, Lam.; *Cerithium reticulatum*, Da Costa; *Turritella triplicata*, Broc.; *Rissoa reticulata*, Mont.; *Trochus zizyphinus*, Lin.; *T. multistriatus*, S. V. Wood; *Odostomia acuta*, Jeff.; *O. rissoides*, Han.; *O. plicata*, Mont.; *Calyptræa Chinensis*, Lin.; *Conovulus pyramidalis*,

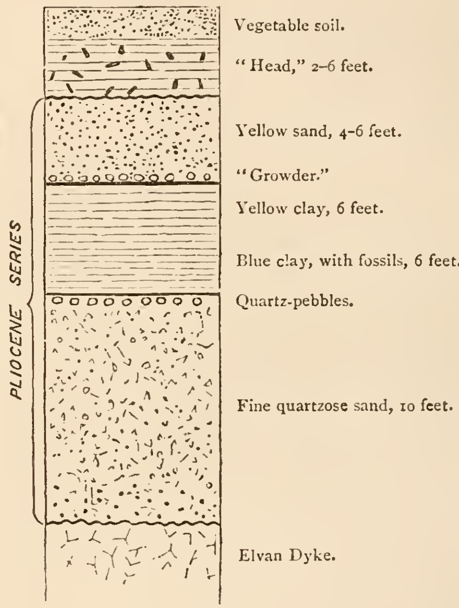


Fig. 50.—Section at St. Erth (after Messrs. Kendall and Bell).

Sow.; *Ostrea edulis*, Lin.; *Pecten maximus*, Lin.; *P. opercularis*, Lin.; *Pectunculus glycimeris*, Lin.; *Nucula nucleus*, Lin.; *Cardium echinatum*, Lin.; *Lucina borealis*, Lin.; *Cardita aculeata*, Poli; *Artemis exoleta*, Lin.; *Tapes pullastra*, Wood; *Mactra solida*, Lin.; *Mya arenaria*, Lin.; *Solen ensis*, Lin.

Messrs. Kendall and Bell* have found 72 determinable species of Mollusca, and about 20 others which appear to be new. Sponges, polyzoa, crustaceans, echinoids, annelids, alcyonarians, holothurians, tunicates, ostracods, and foraminifera also occur. Tunicates have never before been found fossil; the species according to Dr. Herdman is closely allied to *Leptoclinum tenue*, obtained by the "Challenger." The foraminifera are very abundant and beautifully

* On the evidence of the Glacial Action in Cornwall (Royal Geol. Soc. Cornwall, 1882).
† Quart. Journ. Geol. Soc., vol. xli. p. 65.

* Quart. Journ. Geol. Soc., vol. xlii. p. 201.

preserved. Mr. F. J. Millet* has published a list of upwards of one hundred species obtained by him. We can strongly recommend this clay to microscopists. A most striking feature in the mollusca is the large number (49) of Mediterranean species, indicating a more direct connection with that sea than now exists. Of the species, 37 occur in the coralline crag, 33 in the lower red crag, 23 in the upper red and Norwich crag. The following table shows some of these relations, and I have also added for comparison, the mollusca from the coralline and red crag, on the authority of the late Mr. S. V. Wood.†

—	Coralline Crag.	Walton Naze Red Crag.	Remainder of Red Crag.	St. Erth Clay.
Total number of species of mollusca	391	148	199	about 92
British and not Mediterranean species . . .	20	13	30	6
Mediterranean and British	154	61	78	41
" and *not* British	51	14	14	8
Neither Mediterranean nor British	24	10	22	36
Species not known living	142	50	55	35

The following occur which are absent from the Suffolk crags, and are characteristic Mediterranean forms: *Fusus corneus*, *Nassa mutabilis*, *Cardium papillosum*, *Cardita aculeata*. The absence of *Fusus antiquus*, *F. gracilis*, *Buccinum dalei*, and *B. undatum*, which are abundant in the Suffolk red crag, is remarkable. *Littorina subaperta*, *Conovulus pyramidalis*, *Nassa granulata*, and *Columbella sulcata*, occur, and form an important connecting link with the red crag. From such facts as these Messrs. Kendall and Bell infer "that, at the period of which we are writing, no channel of direct communication existed between the North Sea and the Atlantic Ocean, the Straits of Dover in the south being closed, while on the north-west the Tertiary volcanic chain threw a barrier across from the north of Scotland to Greenland, by way of the Shetland and Faröe Islands and Iceland."

"The study of the present configuration of the North Atlantic is strongly confirmatory of this opinion. The 100 fathom line encloses the Orkneys and Shetlands, while a long submerged ridge with deep water upon each side extends from the Hebrides to the Faröe Islands and, as has been so fully explained by the late Dr. Jeffreys, has had a great influence in preventing the intermingling of the marine faunas upon each side of it."

The facts against this theory are chiefly limited to the occurrence at St. Erth of *Cardium elegantulum*, which does not live farther south than Norway, and of *Conovulus pyramidalis*, which occurs only in the crags of East Anglia, and in the glacial deposits of Wexford.

Most authorities seem agreed as to the age of these beds, with the exception of Mr. Clement Reid,* of the Geological Survey, who correlates them with the Lenham beds, which are probably of Lower Coralline Crag age. And we must confess that the 37 species occurring in the Coralline Crag, against only 33 in the Lower Red Crag, does seem in favour of this; nevertheless, this numerical method of correlation is not altogether free from objection. Mr. Reid also considers the depth at which the clay was deposited to have been from forty to fifty fathoms; but Mr. Bell† cannot agree with so great a depression, the shells in his opinion indicating a much shallower sea.

It is to be deplored that our three chief authorities on the Mollusca of this period have recently passed away. Dr. Gwyn Jeffreys, Mr. Searles V. Wood, jun., and Mr. Robert G. Bell, had each commenced an examination of the St. Erth mollusca. Writing on this deposit in the "Geological Magazine" for October last, Mr. Bell says:—

"It is hoped that a more detailed examination of the molluscan fauna may soon be completed, and the whole series added to the national collection."

But it was not to be.

For those who wish to go further into this subject, we would refer them to the papers above mentioned, more especially to the excellent account by Messrs. Kendall and Bell. X.

* Royal Geol. Soc., Cornwall.
† Crag Mollusca. (Palæontograph. Soc., 1874.)

* Nature, vol. xxxiv. p. 342, 1886.
† Geol. Mag., p. 468, 1887.

NOTES ON THE EIGHTH EDITION OF THE LONDON CATALOGUE OF BRITISH PLANTS.

By Arthur Bennett, F.L.S.

[*Continued from page* 110.]

1517, added species gathered in Norfolk by my daughter and myself; its first record in Britain. *N. minor* ought to occur, it is somewhat like *N. flexilis*.

1518, added species from a canal near Manchester, perhaps brought with Egyptian cotton.

1528 will be named *S. nanus*, Sprengl.

1530 will be named *S. Numidianus*, Vahl.

1535, authority should be "Smith."

1538*b*, authority, "Koch," is a var. with compact spikes and enlarged tubers on the roots.

1539*b* is a var. found by Dr. White in Perthshire, described by Sonder in his "Flora of Hamburg."

1540 is 1387, 7th ed.

1541 is 1388, 7th ed.

1544, *b. longifolium*, Hoppe, is a large form of the plant. *c. alpinum*, Gaud., is the Alpine one-

headed form called *E. gracile* by Smith; alter names in Catalogue to the above.

1549, added species found by Mr. Brebner in Perthshire; should be searched for elsewhere in Scotland, it is smaller and with fewer flowers than the common species.

1551 is 1384, 7th ed.

1554 should have been enclosed in rounded brackets, to show that, although formerly found, it is now extinct.

1561 *b*, a form difficult to distinguish from *arenaria*, unless in flower, though generally made a species.

1562 should be *C. diandra*, Schreb.

1564 *b*, a form of the plant growing generally isolated and with rigid panicle, &c.

1566, a species naturalised by the Thames near Kew, it is an abundant N. American species.

1569 is 1427, 7th ed.

1569 *b*, spell with small *g*; is an Alpine var. gathered by Rev. R. Linton in Glen Shee.

1572 should have the last "en" cut out.

1573, an added species. Founded on a specimen gathered by Dr. H. Balfour on Lochnagar some years ago. Probably occurs also in Forfar.

1581 *b*, a var. from Cambridgeshire, usually a smaller, more gracile plant with narrower spikes than *stricta*.

1582 *b*, a var. with the glumes much longer than the fruits gathered in Norfolk.

Var. *c*, a var. from the north of Ireland, determined by Dr. Christ.

1582 *d*, a var. gathered in Salop and Cambridge, determined by Dr. Almquist, it is much smaller than the type with slender spikes and glumes.

1583, an added species from the coast of Norfolk.

1584 *b*, a large form of *rigida*, simulating *aquatilis*, which it is often named.

1585 *b*, this varietal name should be altered to *elatior*, Babington, 1st ed. of "Manual of British Botany, 1843," while Syme's name only appeared in the 3rd ed. of "English Botany."

1585 *c*, a rare form with aristate glumes, gathered sparingly by the Wick river in Caithness by Mr. Hanbury.

1585 *d*, a var. in habit somewhat between *aquatilis* and *Goodenovii* (*vulgaris*), found by Dr. White in Perth.

1586, an added plant from the Wick river, Caithness, a very interesting addition to our flora of an Arctic species belting the globe at high latitudes.

1587*b* may be held to be the same as 1442*b*, 7th ed.

1588, alter name to *C. flacca*, Schreb.

1596 *b*, a variety from Yorkshire figured in the "Journal of Botany."

1598, alter name to *verna*, Chaix.

1598 *b* may well be expunged. It was founded on plants gathered in the Irish mountains, strongly simulating the continental *C. capitata*, L., the male spike suppressed, and altogether so unlike præcox as to be well thought something else.

1603. This interesting Carex has been gathered by several botanists from Glen Lyon, Perthshire, so that Don's plant can now certainly take its place in our lists.

1604. I have seen the original specimens gathered by Mr. Sadler in Glen Callater, and Mr. C. B. Clarke and Mr. N. E. Brown, of the Kew Herbarium, consider them *C. frigida* of Allioni. Along with them Dr. Macfarlane kindly sent a sheet of specimens of certain *C. frigida*, localised from the Clova mountains. Mr. Bentham (5th ed. of his "Flora") considers the Scotch plant "not the true plant of Allioni, but a variety of *vaginata*."

1614 *b* may be held 1467 *b*, 7th ed.

1614 *c*, an added plant, is a sterile form of *fulva* or an hybrid *fulva* × *flava* for Orkney and elsewhere.

1615 *b* consider as 1468 *b*, 7th ed.

1616 *b*; this is the usual form of *flava*, and may be held about equal to the var. *lepidocarpa* of 3rd ed. of "English Botany" and "Topographical Botany." The true *lepidocarpa* is decidedly rare. I have myself only seen it from Caithness and Yorkshire.

1621, alter name to *acutiformis*, Ehrh.

1623 is 1476, 7th ed.

1623 *b* is a large, broad-leaved, long-spiked form from Wales, &c.

1624 *b* is very rare as a British plant. I have seen only one specimen, gathered by Mr. Druce in Perthshire.

1626, alter authority to "Linn."

1627 is 1484, 7th ed.

1634, added species, found near Southampton by the Messrs. Groves, it is in some respects intermediate between 1632 and 1633.

1638 is 1489, 7th ed.

1640, added species. A small annual plant now found in several counties, but evidently introduced with seeds.

1642, alter name to *A. myosuroides*, "Huds."

1651 is 1499, 7th ed.

1653 is 1482, 7th ed.

1656 *c* is a seaside var. found in Caithness, &c.

1657 *c* is a var. found by Mr. Bagnell in Warwickshire, and since in several counties, it connects *alba* with *vulgaris*.

1662, alter name to *G. australe*, Beauv.

1665, added species of *Calamagrostis*, gathered by Mr. Grant in Robert Dick's station, recorded in his life by Dr. Smiles. Dick supposed it *Lapponica* of Hooker, but Mr. Grant's specimens proved it to be the Arctic species named, which is rare in Europe, in Lapland, Finmark, and Norway.

1666 is 1516, 7th ed.

1667 is 1512, 7th ed.

1668 is 1513, 7th ed.

1670 *b* is a var. with numerous stems to the root and denser heads.

(*To be continued.*)

NOTES ON THE DEVELOPMENT OF THE GNAT (*TIPULA PLUMOSA*), LINN.

By Harry Thomas.

I FIRST found the larvæ on the carcases of some dor-beetles I had fished out from a water-butt in my garden.

Shortly afterwards, my brother found a cluster of the eggs attached just beneath the surface of the water, to the side of a neighbouring water vessel. We did not then know that these eggs were in any way related to the larvæ, until a close examination of the living larvæ that hatched out from them, revealed their close similarity. Later we secured specimens of the eggs and larvæ from a tank in a garden at Bettws y Coed.

The female lays her eggs, arranged spirally in a

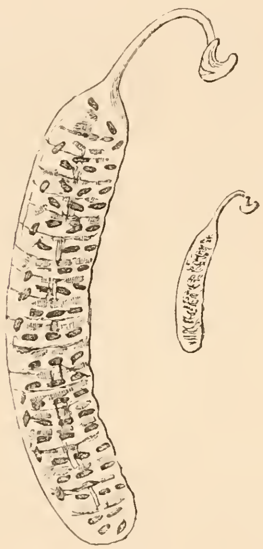


Fig. 51.

sausage-shaped, colourless jelly, varying from ¼ inch to 1 inch in length beneath the surface of still waters. I obtained specimens during the months of August, September, and the early part of October. They were found usually attached to the side of the vessel, by an adhesive disk terminating a prolongation at their upper extremity, just beneath the water: but sometimes unattached, suspended several inches beneath the water, when the disk reaches to, and floats upon the surface. When first deposited, the eggs are closely packed together, forming a short brown string. In a very short time the connecting envelope absorbs the surrounding water till it has increased to many times its original bulk. The eggs then become separated and form an inner spiral chain. Slightly magnified, the egg-case appears divided into many equal segments by narrow transparent rings, and two transparent threads, twisted with each other, may be traced from the neighbourhood of the lower to the upper extremity, where they unite and are continued beyond, as a single thread terminating in an adhesive disk (Fig. 51). The eggs appear somewhat oval in form and are arranged in a spiral which shirks a complete turn and when all but round makes a loop and goes back again. The nearly completed rings thus formed lie each within a separate segment.

The following notes on the development were taken from superficial observations of the specimens beneath the microscope, without any previous preparation.

Development Within the Egg.

The egg presents in profile a convex upper and a flattened lower surface (these terms, upper and lower, are applied simply for convenience). Looking down

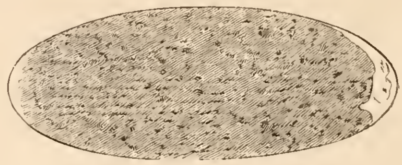


Fig. 52.

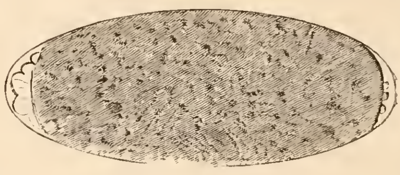


Fig. 53.

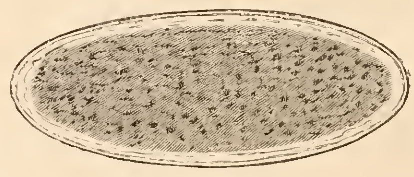


Fig. 54.

upon it the appearance is oval. The shell is somewhat elastic, and is perfectly transparent and structureless, so that the development of the embryo may be easily observed.

First Day. October 15th. 5 p.m.—Examined a few minutes after the eggs were deposited; each contains yellow granular yolk for the most part, but at either extremity, colourless protoplasm. The contents fill completely the enclosed space (Fig. 52).

7.30 p.m.—The contents have receded slightly from both extremities of the shell, farther from one than the other. The colourless protoplasm is observable at one extremity only, the opposite appears bilobed.

9.30 p.m.—The yolk granules have retreated from these two lobes, and other similar though smaller

lobes accompany them. A few yet smaller lobes occur at the other extremity. (Fig. 53.)

Second Day. October 16th. 11.30 A.M.—The yolk has retreated equally from all parts and is surrounded by a granular protoplasmic layer. The thickness of the egg-shell is distinctly visible. In the majority of the specimens the yolk is equally granular throughout (Fig. 54), but in others upon the same slide the granules have collected together forming apparently hollow spheres.

2 P.M.—The protoplasmic layer has broken up into numerous small divisions (cells). An outer layer of cells is at first visible, but later in the day the whole

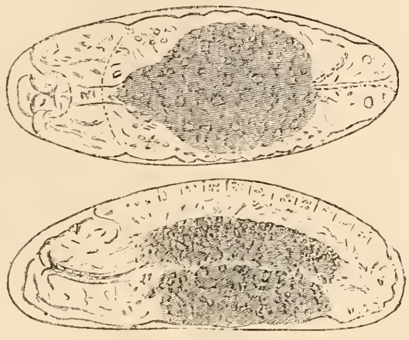


Fig. 55.

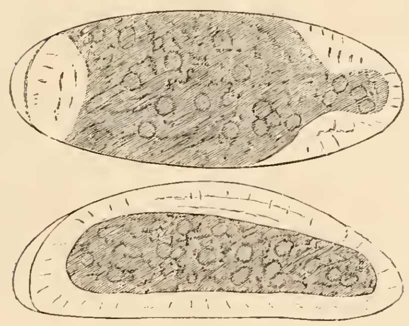


Fig. 56.

layer forms two layers. The yolk contains numerous yolk spheres.

10 P.M.—The position of the yolk has altered considerably. In profile the yolk still occupies a nearly central position, but looking down upon the egg, it is seen to extend to each side. It stops before it reaches the posterior extremity, being produced further at the sides than in the centre, the posterior of the embryo being formed of granular protoplasm and not quite extending to the shell. Anteriorly the yolk tapers to a neck which does not extend to the shell, but is surrounded by granular protoplasm. (Fig. 55.)

Third Day. October 17th. 9.30 A.M.—Viewed in profile the commencement of the segments is faintly indicated at the upper surface. The yolk extends to the anterior upper surface and is nearly separated into two portions by a bite, which occurs on the upper surface a short distance from the anterior. Looking down upon the egg, the only noticeable change is the paleness of the neck at that portion where the bite occurs.

6.30 P.M.—This bite in the neck of the yolk preceded the formation of the head-fold, noticeable on my next observation. An indentation at the posterior extremity represents the commencement of the hind gut, while a similar indentation beneath the head-fold that of the fore gut.

Fourth Day. October 18th. 9.45 A.M.—The fore-gut and the hind-gut are both apparent, they are lined by a layer of cells. The yolk is more concentrated, lying between these embryonic organs, and the mid gut is formed within its upper portion. The appendages of the head now appear as bulging processes.

10 P.M.—The segments do not appear completed, they are not apparent on the surface against the lower surface of the shell. The fore and hind guts extend to the mid-gut, both anterior and posterior limbs are

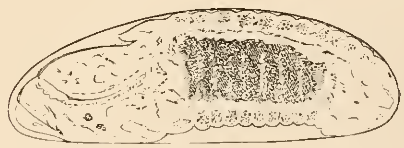


Fig. 57.

represented by corresponding processes as also the papillæ of the terminal segment. (Fig. 56.)

Fifth Day. October 19th. 2 P.M.—The larva has now attained the complementary number and form of the limbs and head appendages. All that is necessary previous to its escape, is that its body should increase in size and the internal viscera be more fully developed. (Fig. 57.)

Growth from this period until its escape is apparent in the body only, which becomes bent upon itself. Besides the occasional movements observed as it adjusts its increasing length to the cramped habitation, the claws of the anterior limbs are, at certain periods, expanded and retracted several times, and often simultaneously the larva scrapes with its mandibles against the shell. These movements may be simply to effect a more comfortable position—although apparently with another purpose—*i.e.*, to aid its escape. Before its escape I observed that the alimentary canal, the nervous and the circulatory systems were complete. The shell as frequently bursts at one point as at another. All the larvæ were liberated on the evening of the 19th.

(*To be continued.*)

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Artificial Silk.—I have often pondered on the humiliating fact that, in spite of all our modern chemistry, we are still dependent on a caterpillar for the production of the most beautiful of our fabrics, the one that would be also the most useful if it were cheaper. We know that it exists within the silkworm as a liquid which, by some process of oxidation or evaporation, or probably of both, becomes a tenacious solid immediately it is exposed to the air. We know its ultimate chemical composition, and also that it is derivable from nearly every kind of leaf that grows, as nearly all are eaten by some species of caterpillar, and caterpillars generally are silk-producers.

We also know that it is obtainable from animal matter, as the flesh-feeding spider also produces it. Not only these, but a multitude of the inhabitants of fresh and sea-water also produce silk. The threads of the various species of mussel, the tubular cases of many species of marine worms, and some of the caterpillar-like caddis worms, are made partially or wholly of a material of silken character. This is also liquid before ejected, and its solidification under water is still more remarkable than that of the sub-aerial silk spinners.

We are now told that M. de Chardonnet has produced an imitation of silk by adding to an etherized solution of the material of gun-cotton (nitrated cellulose) a solution of perchloride of iron, and to this mixture a small proportion of a solution of tannic acid in alcohol. This is filtered and then forced by gentle pressure through a fine tubular orifice, dipping into water acidulated with nitric acid. The issuing fluid thus forms a semi-solid thread which can be drawn forth and then wound, after complete solidification by passing through a dry air space. It is grey or black, but may be dyed. The thread thus obtained is described as tenacious, supple, transparent, and of silky appearance and touch, and is not attacked by acids or alkaloids of moderate strength, but is soluble in etherized alcohol and acetic ether. The account I have read does not tell us whether it has been used as a varnish, which from the above description appears to be its most promising application.

Cotton and other fibres covered with an adherent film of such material would serve as the basis of beautiful fabrics, and it might even be made into waterproof sheets by simply painting it over surfaces to which it would not adhere, and then skimming off the film.

When we remember the small beginnings of some of the greatest achievements of applied science, this effort of M. de Chardonnet is very promising. Others will doubtless proceed with the problem, and however great may be their success by improving upon this first step, let us hope that the pioneer will not be forgotten in awarding the honour and profits that may follow.

The Colouring Matter of Blue John.—Every visitor to the Matlock district of Derbyshire and its catch-penny shows of abandoned lead workings that are exhibited as natural caverns, and its twopenny tolls for walking on highways and byways, is familiar with "Blue John," specimens of which are largely sold there, and some of it is actually found in the neighbourhood. It is a variety of fluor spar (Calcium fluoride) in which the blue tint is very deep and beautiful. The composition of the colouring matter has remained unexplained until lately. On the 10th of April last, Mr. A. Norman Tate read a paper before the Liverpool Geological Society, in which he showed strong reasons for concluding that the colour has an organic origin. If the further investigations that are promised confirm this, other questions will be opened, such as whether the organic matter is of animal or vegetable origin, and of what class, and how it came thus diffused through the mineral. It is by no means necessary that the material which gives the blue colour to the fluor spar shall itself be blue. This is shown by the fact, that the most intense and brilliant of all blue minerals, of all blue pigments, *lapis lazuli*, and artificial ultramarine, are composed of materials, none of which are blue, viz., silica, alumina, soda, sulphur, lime, sulphuric acid, iron, chlorine, and water or potash.

A Prism of Flame.—Everybody knows that prisms have been made of glass, and other refracting solids, and all who have given any special attention to the subject also know that fluids such as carbon bisulphide have been formed into prisms by enclosing them in glass walls, and that spectra have thus been obtained corresponding to the dispersive powers of the material of the prism. A. Winkelmann has recently gone further, has made prisms of flame affording opportunities for examining the dispersive powers of incandescent vapours thrown into the flame. He tried to obtain prismatic flames by enclosing them in plates of talc or mica, but failed, and finally succeeded by using a Bunsen burner of triangular section and placing on the top of the tube a double thickness of wire gauze, and on that again a triangular support smaller than the section of the burner. This carries an iron cup in which is placed the sodium or other material, the vapours of which are to be examined. By these means he obtained a special anomalous dispersion when the flame was largely charged with sodium and potassium vapours; but only negative results with other substances. This failure he attributed to the insufficient density of their vapours.

The flame itself appears to have done nothing, the light passing through it unaltered. This is completely in harmony with the results of my own experiments on flame described in chapters vii. and viii. of "Fuel of the Sun."

TRICKERY ON TIN.—It is well for all of us that the gamblers who have been rigging the tin market are laid on their backs. Let us hope that they will remain there, as the extravagant rise in the price of that metal which they temporarily obtained by the customary tricks of their class threatened to create another very dangerous form of fraud, viz., a large addition of lead to the tin which is used in tinning the iron plates of which the cans now so largely used for preserving provisions are made.

Lead is a peculiarly treacherous poison; its soluble compounds belong to the class to which the name of "slow poisons" has been applied. A small dose may be taken to-day, another to-morrow, and so on for some time with no perceptible effect; it appears to remain in the system, but if the dose is repeated with sufficient frequency the accumulation begins at last to act with serious consequences.

Mr. Jacob Reese, of New York, speaking to his fellow-countrymen, who consume so much tinned fruit, advises them to eat no fruit canned in 1888. This was at the time when the syndicate of tricksters had run up the price of tin to some 60 or 70 per cent. above its natural value. The simple fact that such advice was seriously and properly given, and the probability of a sudden panic arising by the poisoning of a few eaters of canned goods, shows the shallowness of the syndicate. Such a panic would at once annihilate about two-thirds of the demand for tin, and this occurring simultaneously with the opening of new supplies must have the effect of throwing down the price of tin far below its old average. This has already happened, even without any particular panic. I find by reference to "Iron" of May 11th, that the London price of tin has fallen from 170*l.* to 85*l.* per ton within a few weeks; the old ordinary price was usually a little above 100*l.* The financial condition of those who rigged the market up to 170*l.* by holding back supplies may easily be imagined. Their ruin is of no serious consequence, rather desirable than otherwise; but the poisoning of the people or the checking of so useful an enterprise as the canning of food for the million is a serious matter.

SPONGE NURSERIES.—The Board of Trade Journal for April describes the progress of a comparatively new and very promising industry. Professor Oscar Schmidt, of Gratz (Styria), has planted small cuttings of sponges in suitable positions, and obtained in the course of three years large and valuable specimens: 4000 of these, with interest for capital expended, only cost 225 francs, about one half-penny each. Those who have had much experience in marine aquaria will not be surprised at this. In the early days of the Crystal Palace Aquarium, I noticed that one of the tanks had a very untidy appearance, as though infested with cobwebs, and on further examination found this to be due to the growth of sponges. The late Mr. Alford Lloyd, who constructed this aquarium, told me that this was one of his common troubles, notably so at the Hamburg Aquarium, where the sponges grew so rapidly that some of the zoophyte tanks had to be frequently emptied and cleared. This was especially the case when the tanks were newly charged with sea-water at certain seasons. I should add that the sponges that thus infested the tanks, like those which abound on our coast, differ very widely from the species that are in commercial demand.

SCIENTIFIC MILLINERY.—When highly-dressed servant girls go out a-shopping, the smart salesmen, who understand their weakness and are allowed a premium for pushing and selling certain inferior goods (vulgarly described as "spiffed"), skilfully force the rubbish on the foolish women by assuring them that each particular sample is "the latest thing out," the fashion that presently will be all the rage. He knows that with such customers intrinsic merit of the goods is a secondary consideration.

It is a rather humiliating fact that there exists in the scientific world a class of pedants who closely resemble these highly-dressed servant girls—young men of the period who are perpetually struggling to make a display of their acquaintance with the latest thing out in technical words and phrases. They profess a profound contempt for what they call "popular" science, and sneer at all who are so old-fashioned as to use the simplest and clearest language, whether old or new. This is especially the case in chemistry, where we now have as many as half-a-dozen names for the same thing, some of them simply absurd, but eagerly adopted on the same basis as the latest fashion in bustles or bonnets.

Having frequently and very plainly expressed my own opinion of such affectation, I am glad to find the following in the second edition of Professor Tidy's "Handbook of Modern Chemistry," and that it is quoted approvingly in "Nature." He says: "If I have used the word 'potash,' and the body I mean to imply thereby is understood, I am satisfied. I confess that the growing necessity for having a translation at one's side in attempting to understand the modern scientific paper, is in my opinion a circumstance to be deplored. Danger, moreover, is always to be apprehended when a language has to be invented to support a theory or a formula. A party Shibboleth has, no doubt, a charm for its special clique. It serves as a bond of union for the initiated, whilst it prevents the interference of outsiders."

My view of the folly is not quite as serious as that of Professor Tidy. Such a clique as he refers to are

probably engaged in contending for a principle which rightly or wrongly they supposed to be sound. The young persons that I have described are by no means addicted to principles; technical verbiage learned by rote constitutes the whole of their scientific attainments.

ASTRONOMY AND METEOROLOGY.

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

At the meeting of the Royal Astronomical Society held on April 13th, it was announced that the Society had been presented with the first volume of the photographic survey of the heavens, sent by the Paris Observatory, and a number of photographs of stellar spective and other astronomical objects sent by the Harvard Observatory of the United States. A paper by Professor Holden was read On the Probable Meteorological Conditions in California during the Total Solar Eclipse of 1st January, 1889. It appears that the eclipse will take place in the rainy season, which is of course much to be regretted, but inland there is some prospect of clear weather.

A paper was read from Mr. Eddie of Grahamstown, On the New Southern Comet. This was stated to have a nucleus similar to a star of the fourth magnitude with a curved tail about four degrees long.

Professor Tacchini states that from October to December 1887 there was but little activity observed on the solar surface, the little that was visible was principally in the southern hemisphere; no spots were recorded in the northern hemisphere.

On June 21st the Sun enters Cancer at 0 hr. in the morning, and summer commences.

There will be no occultations worth observing this month.

Mercury will be an evening star in a good position for observing.

Venus will be a morning star all the month in Taurus until near the end, when it will enter Gemini.

Mars will be in Virgo.

Jupiter will rise early in the evening in Libra.

Saturn will be an evening star in Cancer.

Meteorology.—Admiral Sir Vesey Hamilton has sent me the following interesting experiences with the Rain-Band Spectroscope.

"Dear Sir, *18th April*, 1888.

"Relative to our conversation a few days ago, I took your pocket-spectroscope to China with me, but did not use it till I was two-thirds of the way down the Red Sea, when the weather being quite clear, and the sun shining bright, I was surprised to find the densest rainband I had ever seen, and this continued till past Socotra Sound, en route to Ceylon, the air was saturated with moisture and temperature for two or three days 95° in shade, and most oppressive. Soon after passing Socotra Sound and till our arriving in Ceylon, the sky became overcast and we had constant rain crossing the Indian Ocean, accompanied with very heavy showers and squalls, thunder and lightning; the temperature was then about 86°. The date was between 10th and 25th October, and the N.E. Monsoon was exceptionally late that year. In China I found the spectroscope more useful in foretelling the approach of fine weather during rain than the actual approach of rain during fine weather.

"I remain, faithfully yours,

(Signed) "R. Vesey Hamilton.

"J. Browning, Esq., F.R.S."

At first reading this would seem to impugn the value of the Rain Band Spectroscope for the prediction of rain—but not so upon closer examination. The important point to observe is that the place where Admiral Sir Vesey made the rain band observation, and the point where the rain fell *were a great many miles apart*, because the vessel was sailing down the Red Rea when the observation was taken, and it is worth noting that at the place where the rain fell it was seven degrees colder than were the observation was taken, a condition which alone would account for its precipitation.

At the Royal Observatory, Greenwich, the highest reading of the barometer for the week ending 21st of April was 29.77 in. on Monday at noon; and the lowest 29.38 in. on Friday at noon. The mean temperature of the air was 48.5 deg., and 0.6 deg. above the average. The general direction of the wind was south-westerly. Rain fell on five days of the week, to the aggregate amount of 0.65 of an inch. The duration of registered bright sunshine in the week was 35.7 hours, against 30.1 hours at Glynde Place, Lewes.

For the week ending 28th April, the lowest reading of the barometer was 20.50 in. on Sunday at noon; and the highest 30.07 in. on Thursday evening. The mean temperature of the air was 43.7, and 4.7 deg. above the average. The general direction of the wind was north-eastern. Rain fell on three days of the week, to the aggregate amount of 0.67 of an inch. The duration of registered bright sunshine in the week was 8.0 hours, against 16.4 hours at Glynde Place, Lewes.

For the week ending 5th May, at the Royal Observatory, Greenwich, the lowest reading of the barometer was 29.23 in. on Tuesday morning; and the highest was 30.15 in. at the end of the week. The mean temperature of the air was 49.0 deg. The general direction of the wind was south-westerly. Rain fell on two days of the week to the aggregate amount of 0.16 of an inch. The duration of registered bright sunshine in the week was 43.2 hours, against 36.4 hours at Glynde Place, Lewes.

For the week ending 12th May, the lowest reading of the barometer was 30.02 in. on Tuesday afternoon;

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in June.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
MERCURY ☿ .	3	5 5M	1 36A	10 7A
	10	5 25M	1 46A	10 7A
	17	5 36M	1 43A	9 50A
	24	5 33M	1 25A	9 17A
VENUS ♀ . .	3	3 21M	11 14M	7 7A
	10	3 18M	11 23M	7 28A
	17	3 18M	11 32M	7 46A
	24	3 24M	11 41M	7 58A
MARS ♂ . .	3	2 19A	7 57A	1 38M
	10	2 0A	7 34A	1 11M
	17	1 43A	7 13A	0 46M
	24	1 28A	6 53A	0 21M
JUPITER ♃. .	3	6 39A	11 0A	3 26M
	10	6 8A	10 30A	2 56M
	17	5 36A	9 59A	2 26M
	24	5 6A	9 29A	1 56M
SATURN ♄. .	3	7 38M	3 32A	11 26A
	10	7 15M	3 7A	10 59A
	17	6 52M	2 43A	10 34A
	24	6 29M	2 19A	10 9A

and highest 30.30in. on Friday morning. The mean temperature of the air was 52·3 deg., and 1·4 deg. above the average. The general direction of the wind was variable. No rain was measured during the week. The duration of registered bright sunshine in the week was 51.0 hours, against 56.4 hours at Glynde Place, Lewes.

The average mean temperature in June is at the Land's End and the Bristol Channel 59°, and it is the same all along the South and South-East Coast. On a line drawn through Beaumaris, Lancaster, York, Hull and Norwich it is 58°. In the Irish Sea, Solway Firth, Berwick, South Shields, Middlesborough and Flamborough Head, it is only 57°, while inland throughout the southern part of England it is 60°. This of course arises from the cooling effect of the sea round our coasts.

The mean average rainfall in June is one inch on the East Coast and two inches over nearly all the rest of England, but in some parts of North Wales and in Cumberland, Westmoreland and Lancashire it is three inches.

NATURAL HISTORY JOTTINGS.

THE GREEN TORTOISE BEETLE (*Cassida viridis*).

[*Continued from p.* 107.]

August 14*th.*—A full-grown larva that has thrown off its fecal canopy as soon as enclosed in a box, has straightened out the heretofore elevated posterior portion of the body, the projecting ventral tube now lying back horizontally in a line with the body, and the two rigid, waved, whip-like anal appendages standing erect at right angles to both body and tube: these appendages spring from the extremity of the body, just in advance inwardly of the ventral tube at its base, do not coalesce, and only move with the body. Shortly, however, and the extremity of the body is again elevated at about right angles, and the rigid anal appendages again projected forwards over the back nearly horizontally, and the larva recommences to feed, the fæces now passed lying on the tip or extremity of the ventral tube for a time, but ultimately dropping off.

The flattened larva is woodlouse-like in form, or elliptical, and has a close array of sixteen pairs of nearly horizontally-set well-branched cylindrical spines springing from the margin of the much and equally depressed thorax and abdomen all around. The thorax and abdomen occupy about equal halves of the entire length of larva, and each section carries eight pairs of the setose spines. The head is black, and is concealed beneath the thorax when the creature is at rest, but, when walking, is in part projected beyond the anterior margin, coming then into view. The colour of the body above is a dull green, variegated with a mottling of pale greenish yellow, which gives to the entire upper surface a greyish green cast or hue: the under surface of the body is of a dull uniform light green colour. The spiracles (of which there are eight pairs, one pair thoracic and seven pairs abdominal) are situated dorsally near the margin of the flattened body, are black with lighter apices, and are elevated; they are cylindrical, lie at an outward angle, and gradually decrease in calibre backwardly towards the apex of the abdomen, the first pair being situated near the hinder margin of the prothoracic segment, and the seven succeeding pairs in the seven anterior abdominal segments. The lateral branched spines are black in the basal one-half, and dusky in the apical one-half: the anal or caudal appendages, which are in reality the two spines appertaining to the lateral margins of the ninth and last abdominal segment, enlarged, modified in form, and changed in direction, for a special function, are also black basally and dusky apically: they are thick at the base, where they are furnished with minute secondary spines, but taper rapidly to a very fine point, and are rigid and waved apically, the waviness or warping being obviously caused by the constriction to which they have been subjected by the several exuviæ retained thereon from infancy to maturity. The legs are six in number, and are short and stout; they are sparsely clothed with short black spines, as indeed is the entire body both above and below. The larva walks slowly; is diurnal in its habits, feeding on the leaves of the thistle during the day from both the upper and under surface, and generally leaving the epidermis intact on the opposite side of the leaf from which it feeds, though not infrequently making a minute hole or holes therein which will account for the holes found amongst the blotches on the leaves, the heat

of the atmosphere shrivelling up the ruptured skin or epidermis; and, sometimes at least, enters into the pupa state on the upper surface of the leaves of the food-plant. After casting its skin, the larva is of a uniform pale yellow colour entirely: the head, limbs, branched spines, anal appendages, and the ventral tube, as well as the body, are all of this uniform pale yellow colour, while the elevated spiracles are white, the exuviæ having obviously been shed from all these parts. The cast skin is run up together into comparatively little bulk, is passed over the extremity of the body and transferred to the anal appendages, the flexile ventral tube being used in pressing it forwards against the fecal canopy; and with its head, flanking limbs, and a complete *chevaux-de-frise* of spines, constitutes a new, larger, and most efficient platform for the reception of the fæces. In a short time the creature in all its parts assumes the normal hues.

When full-grown, and about ready to lay itself up prior to assuming the pupal condition, the larva throws off the fecal canopy, and takes a meal or two more; then it stretches itself out horizontally, retracts the two segments of the telescopic ventral tube until the basal and larger one is much shortened and the apical one so invaginated and withdrawn within the basal that only the tip projects beyond it, the anal appendages being now erected perpendicularly; whilst the head and limbs are drawn up closely to the under surface of the body, the head being deeply sunk into the tissues, and the limbs directed backwardly as well as being somewhat drawn together and sunk; and the antero-inferior portion of the abdomen (embracing the first three segments) is pressed down firmly upon the object chosen for the change, and thus formed into an ovalish and flattened disk, beneath which is placed, or from which exudes, an obviously tenacious fluid of a dark colour which anchors the larva to the spot, aided probably by the short and stout spines which sparsely clothe that region. In this position it remains for a period of fully four days, gradually growing darker in colour, and assuming a ruddy hue along the back. On the fifth day, after a good deal of very vigorous motion, during which it becomes quite evident that the antero-inferior abdominal disk is the only point of attachment of the larva to its seat, the skin of the upper anterior portion of the thorax becomes ruptured and the lively pupa vigorously pushes itself forward out of the larval envelopes, wriggling and twisting, expanding and contracting, and frequently raising itself up nearly vertically in its anterior three-fourths or so, until the exuviæ has passed beyond the fifth abdominal segment, when its efforts cease, and the remaining abdominal segments remain incased within the exuviæ which firmly retains and moors the pupa. The colour of the newly-emerged pupa is pale green, variegated with pale dull orange and the now nearly white dorsal mottling of larvahood; but in a few hours it has darkened—become nearly black, with ruddy dorsal markings. The spiracles, now reduced to four pairs appertaining to the first four abdominal segments, are white in colour, and are much more elevated than in the larva.

In the pupa, the thoracic region is flattened out horizontally all around, both laterally and anteriorly, this extension having become nearly semicircular in outline, and being quite thin; and instead of being surrounded with eight pairs of strong branched spines as in larvahood, it is only margined with simple small spines, two pairs of which, however, the fourth and fifth from the mesial line anteriorly, are longer and stronger, and furnished with some minute spines. The pair of spines on the lateral margins or edges of each of the five anterior abdominal segments (which are all that can be seen, owing to the exuviæ being still attached to and covering and concealing the remainder of the abdomen of the pupa) are also flattened out horizontally quite thin, but are still furnished around their margin with secondary spines; they are at the base equal in width with the segment, and are directed outwardly, and inclined upwardly at a considerable angle. Possibly the extraordinary extension of the entire margin of the thoracic region is due to a horizontal flattening-out, and a coalescence of the eight pairs of spines which surrounded that region during larvahood; and in the flattening-out of the abdominal spines we may see the same process in operation, which in the imago will be fully evolved and seen in the extensive marginal addition to the elytra which obtains. On the pupa first emerging, the thin marginal extension of the thorax is infolded, as are also the flattened-out abdominal spines, but they both rapidly unfold.

In ten days after the pupa-state has been entered, the perfect beetle emerges through a breach in the upper anterior portion of the pupa-case. It is at first of a pale green colour above, and a fine salmon colour below, with some black variations; *i.e.*, the prothoracic shield and the elytra are of a uniform pale green, and the thorax and abdomen are of a salmon colour with some black variations inferiorly, the salmon colour showing through the as yet only semi-opaque shield and elytra, as do also the head and antennæ. In a few hours it has become much darker green above, and is entirely shining black beneath.

(*To be continued.*)

SCIENCE-GOSSIP.

Mr. Walter Gardiner, M.A., has just concluded a course of three interesting lectures at the Royal Institution, entitled "The Plant in the War of Nature."

We have received a reprint of the "Land and Freshwater Mollusca of Leicestershire," by Mr. H. E. Quilter.

The "Selborne Magazine" is now published by Mr. Elliot Stock. The last number is the best yet issued.

Among new recent issues, special notice must be taken of "The Westmoreland Note-book, and Natural History Record," a quarterly magazine, published by Mr. Elliot Stock. The first part is capital reading.

An important paper, by Mr. W. J. Simmons, on the "Study of the Mango-Weevil," has just been reprinted from the "Journal of the Horticultural and Agricultural Society of India."

Engineers ought to read a paper in the last number of "The Naturalist," by the Rev. Arthur Watts, on "Coal-dust and Explosions in Coal-Mines."

We have received the second part of Mr. Howard Saunders' "Illustrated Manual of British Birds," (London: Gurney and Jackson; successors to Van Voorst). Both text and illustrations promise that this will be the best popular work on the subject yet issued.

An Italian Microscopical Society has just been formed, whose articles and papers are to be published in Latin, French, English, and German. The address of the Secretary is Mr. J. Platania, 14, Via S. Giuseppe, Acireale, Sicily.

The members of the Geologists' Association made a two days excursion on Whit Monday and Tuesday (May 21st and 22nd) to Charnwood Forest, under the directorship of the Rev. E. Hill and Mr. J. D. Paul. On June 1st, Mr. J. G. Goodchild reads a paper on "The Natural History of Gypsum."

At a meeting of the Philadelphia Academy of Natural Sciences, Professor Ryder described a ring-like prolongation of the placenta in embryo mice and rats as indicating the descent of these animals from lower types in which the placenta was zonary.

Professor Claypole ("American Naturalist") concludes that the ice at one time dammed up the Ohio above the site of Cincinnati, forming a sheet of water which he names Lake Ohio. As the banks of the Ohio are 400 to 500 feet high at Cincinnati, the ice must have been thicker than this. If assumed at 500 feet, the rim of the ice would be 365 feet above the level of lake Erie. The entire south of Ohio, a large portion of West Virginia, and parts of Kentucky and Pennsylvania must thus have been under water, forming a lake about 400 miles by 200. At one time Lakes Erie and Ontario formed a single vast sheet of water, held by an ice-dam at a level of 700 feet above the sea.

An island has been selected by the New South Wales authorities on which Pasteur's method of extirpating rabbits is to be thoroughly tried.

MICROSCOPY.

The Royal Microscopical Society.—The last number of the Journal is a valuable one. It contains, in addition to the exhaustive summary of Current researches relating to Zoology and Botany, the Address of the President (the Rev. Dr. Dallinger), and a paper (illustrated) by Mr. George Massee, "On the Type of a New Order of Fungi." The latter is intermediate between the Nidulariaceæ and the Hymenogastres.

Volvox Globator.—In reply to R. H. Nisbett Brown's query, the Tremella he speaks of is probably the genus of that name among the Hymenomycetous Fungi. If he wishes to make the infusion referred to, and note if *V. globator* occurs in it; let him search on decayed stumps, logs &c., after rain, and if he lights on a shapeless jelly-like substance, it is almost certain to be some species of Tremella.—*P. F. Gillet.*

ZOOLOGY.

The Development of the Polyzoa.—We regret that, owing to a clerical error, Figs. 47 and 48, in Mr. Shipman's important paper on this subject last month, the name of Fredericella was placed under them instead of Paludicella. Readers interested in the subject will please note.

Tennyson's Natural History.—In a volume of "Early Poems" by the Poet Laureate, recently published, there occur some expressions which, to say the least of them, are rather eccentric from a natural history point of view, *e.g.*, this line—

> "Deeply the wood-dove coos: *shrilly* the owlet *halloos*."

Surely the author is sacrificing accuracy for the sake of catching a bad rhyme. No stretch of imagination could represent the sounds emitted by the owlet as a "shrill halloo." Then what are the "quick lark's *closest carolled* strains"? Again, we read that Nature

> "greens
> The swamp where *hum* the dropping snipe."

Does the snipe *hum*? These, and many similar instances which may be quoted, seem to exceed the licence allowed even to poets. But the Laureate has achieved a reputation as a naturalist among some of his admirers for such discoveries as that *ash birds are black in March*, a fact known to every village boy in the kingdom.—E. H. V.

Hawaiian Butterflies.—At the last meeting of the Entomological Society of London, Mr. E. Meyrick communicated a paper "On the Pyralidina of the Hawaiian Islands." Mr. Meyrick pointed out that the exceptional position of these islands renders an accurate knowledge of their fauna a subject of great

interest. He stated that of the fifty-six known species of Hawaiian Pyralidina nine had probably been introduced through the agency of man in recent times; but he believed the remaining forty-seven to be wholly endemic: of these latter the author referred twenty-six species to the Botydidæ, twelve to the Scopariadæ, four to the Pterophoridæ, three to the Crambidæ, and two to the Phycitidæ.

BOTANY.

PURPLE-EYED DAISIES.—Walking along the edge of the cliff at the sequestered inlet of Dumpton Gap, on the way from Ramsgate to Broadstairs, I came upon a tuft of daisies each having an orange-red spot in the centre of its disk. I dug up a root and potted it, and the new blown blossoms present a sufficiently curious and rich appearance for such common objects as wild daisies, the colour in the centre being fresh and deep. Examined closely, it is seen that the orange-red spot is caused by the flowerets at the centre of the disk having their petals tipped with purple, a peculiarity often noticed in those of the ray, the commingling of their rich yellow producing the effect of orange on the retina. This flower has long done duty as an exponent of Design in Nature; here it puts in a claim for Evolution or Work.—*A. H. Swinton.*

PRESERVING FLOWERS.—Having noticed in the "Journal of the Pharmaceutical Society" an article, on Preserving the Colours of Flowers in dried specimens, I append the following copy:—The process consists of steeping the plants in a solution of sulphurous acid containing one-fourth of its volume of methylated spirit. Delicate flowers require only five or ten minutes immersion, and thick leaves as much as twenty-four hours. They are then removed and the fluid allowed to evaporate from the surface by exposure, and then dried between paper in the usual way. Another advantage is that plants so treated are dried much more quickly and easily than those which are simply pressed and dried when fresh.—*W. J. Hopkinson.*

"ANNALS OF BOTANY."—The February part completes the first vol. of this notable and important work, edited by Professor J. B. Balfour, Dr. Vine, and Dr. W. G. Farlow. It contains papers as follows: "The Apical Cell of Fucus," by W. Mc. M. Woodworth; "The Procarpium and Fruit in *Gracilaria confervoides*," by T. Johnson; "On the Germination of the Tubes of the Jerusalem Artichoke," by J. R. Green: "On the Sensitive Labellum of *Masdevallia mucosa*," by F. W. Oliver; "The Effect of Cross-fertilisation on Inconspicuous Flowers," by Anna Bateson; "Microscopical Anatomy of the Common Cedar Apple," by Aylmer Sanford; "On some Normal and Abnormal Developments of the Zoophyte in Trichomanes," by F. O. Bower; "On the Floating Roots of *Sesbania aculeata*," by D. H. Scott; "On some anomalous cells developed within the interior of the vascular and cellular tissues of the Fossil Plants of the Coal Measures," by Professor Williamson; "Some recent publications bearing on the question of the sources of Nitrogen in Nature," etc.

GEOLOGY, &c.

ICE-GRAVING IN THE ISLE OF MAN.—In a very readable paper in the April number, Dr. P. Q. Keegan tells us something of the salient points of the Geology of the Isle of Man. Excellent as the paper is in the main, an unaccountable error is made when we are informed that "there is little or no evidence of local glaciers, or indeed of ice-chiselling of any kind." My personal knowledge of the island's geology is confined to the shore line of the south, from Langness to Port Erin, and in this narrow strip I have found abundant proof of ice-action. The greater part—from the west side of Langness to mid-way between Port St. Mary and Spanish Head—of this coast line is hewn out of carboniferous limestone, and wherever the protecting soil or boulder clay has been recently removed from its surface, we are almost sure to find ice polishing and striæ. Scarlett Quarry, where the overlying boulder clay has lately been cleared out, affords a remarkably well-preserved instance of glaciation. On the horizontal surface of the limestone a little distance back from the quarry face, the rock is eaten into troughs and hollows 7 or 8 inches deep, marking a pre-glacial work of solution by rain water. Seaward of this the surface ceases to be horizontal and slopes gently towards the shore. This part is beautifully polished and engraved with clearly cut parallel striæ—running N.E. to S.W.—distinct and fresh as when the ice mantle receded and disappeared in the far-off days when the bond of union between Mona and Norway consisted, not in warm Viking blood and heroic saga, but in dreary ice-rivers and snowfields. On the striated surface, close to the junction with the corroded one, we see here and there little depressions with irregular bottoms—plainly the lower parts of pits once similar to those intact hard by; so that we have here a horizontal surface not touched by ice, bordered by a slightly sloping one from which several inches of rock must have been planed away by glacial friction. Equally good examples of unmistakable ice-action are exposed south of Port St. Mary, where quite a considerable cliff of boulder clay rests upon striated limestone. South of the pier at this little fishing village, the ice has passed over the upturned edges of the strata grooving and rounding them; producing outlines as

different as possible from those wrought by the action of other denuding agents. Further on is a little stack of limestone, the vertical faces on all but the side fronting the sea, bevelled and striated, and close by, a similarly glaciated high shelf—forming together a tiny valley or gateway, admirable as an illustration of how a glacier pouring down a valley, adapting itself to the rocky channel, grinds smooth the rough places in the bottom and sides. Fragments of polished and striated surfaces and rubbings on paper of striæ from the above described spots are at Dr. Keegan's disposal, should he wish to see them.—*James Hornell.*

Eozoon Canadense.—Sir J. W. Dawson has recently given in the "Geological Magazine" some new facts regarding *Eozoon Canadense.* Though the form of this body is ordinarily regarded as indefinite, well-preserved specimens show that the normal shape of young and isolated examples is a broadly turbinate, funnel-shaped, or top-shaped form, with sometimes a depression on the upper surface. Other forms are rounded or dome-shaped masses. In sections more or less cylindrical, depressions or tubes may be seen. If Eozoon was an organism growing on the sea-bottom, it would be liable to be broken up, and in this condition to constitute calcareous sand or gravel; examination of Laurentian limestone frequently reveals the presence of Eozoon. *Cryptozoum*, whatever be its zoological relations, is found in the Cambrian rocks under the same conditions as Eozoon in the remarkable imitative forms of gneiss, laminated limestone with serpentine, and various other laminated or banded materials which are often found in collections or specimens of Eozoon.

Bedfordshire Clays, &c.—At a meeting of the Bedfordshire Archæological and Natural History Society held at Bedford (April 12th) Mr. A. C. G. Cameron, Geological Survey, read a paper on the "Clays and Bricks of Bedfordshire." He described the geological formation of the country, and entered at length into an examination of the clays and the localities in which they exist. The manufacture of bricks and kindred fabric out of Oxford clay was given in considerable detail; and the nature of the soils and subsoils touched on from an agricultural point of view. With regard to the Ampthill Clay, there is a thick mass of it exposed in the cuttings of the Midland Railway near Ampthill Station. At the northern entrance to the tunnel, there are several noticeable layers of stone, manifestly concretionary and containing fossils. These concretionary stones lie amongst the clay in a contrary way to the bedding. To the south of the tunnel, the clay is blacker and contains Kimmeridge forms of fossils. Professor Seeley has correlated the clay with septarian concretions in the Ampthill cutting with those of the St. Ives and neighbouring brickyards, localising it as the Ampthill Clay. It may, therefore, be considered as a passage bed between the Oxford and Kimmeridge Clays. The lecturer said he must not omit to mention a characte of the Ampthill Clay which he thought justified his bestowing on it the term "troublesome," an epithet which any one who has anything to do with that portion of the line will endorse. This is its sensitiveness to the weather, the result of which is that the cutting presents an appearance of disorder more compatible with that of a line in course of construction than with that of an established road over which for so long so many trains have daily run. As is well known, huge masses of the clay become detached from the sides of the cutting and slide forward with a tendency to fall upon the line. This is frustrated by the expedient of burning the clay on the spot, constructing with it platforms at the foot of the slopes. These present a rough surface, arrest the progress of the sliding mass, and preserve the rails intact. If grass were grown on these slopes, it is not improbable as the surface is added to by the growth of the vegetation, the slides would be of less frequent occurrence, if not entirely stopped.

The paleontological and lithological characters of the Oxford Clay as exhibited at the various brick-works were also described, reference being made to the use of the word "glass" for selenite amongst the workers in Oxford Clay, in connection with selenite in Germany, being sometimes popularly called *Frauenglas*, or *Marienglas.* The brickyards on the Clapham road, Box End Kempston, Bletsoe, Sharnbrook, and others at a greater distance from Bedford, are opened just beneath a bed of yellow sand and bluish loam, the "mild clay" of the builders. To this sandy bed, the basement bed of the Oxford Clay, the name of "Kelloways Rocks" has been given from Kelloways, in Wiltshire, where it was first brought into notice by William Smith, the father of English geology. In old times, owing to the difficulty of transporting road metal, local stones were much more used than they are now; thus the rock at Kelloways was then used for that purpose. At Bedford it is characterised by hard lumps or "doggers" of calcareous sandstone that lie very prominently amongst the sand and loam. Beyond the town, which partly stands on it, the Kelloways can be traced up the valley as a fairly persistent bed or narrow belt of sandy soil, out from which the hard stone or "dogger" is seen protruding.—*Beds. Times*, April 21, 1888.

NOTES AND QUERIES.

Early Nesting of the Chaffinch and Blackbird.—My attention was drawn the other day to the fact, that a chaffinch's nest with five eggs was got on the 16th January, at Craigfin, Maybole, Ayrshire. Yesterday I visited the farm, and found the report correct, the tenant kindly gave me particulars. The nest was found in the side of haystack, an unusual site for the species to build. When it

became known, unfortunately, a boy destroyed the nest and four of the eggs, the farmer having the other in his possession. On examining it, though much broken, I find it has been hard set, and would have been hatched in a few days. It would have been very interesting to have known whether the young could have been brought up at this early season. A blackbird's nest with young has also been got in a plantation on Culzean estate, about the beginning of February, these instances showing the remarkable mildness of the season.—*W. R. N.*

MUNCHAUSEN STILL ALIVE! A weekly and much-read paper has the following bit of veracity: *The Human Blood.* — "Professor Bronson (an American) states, that if a drop of human blood be subjected to examination by the hydrogen microscope, and magnified some 20,000,000 of times, all the species of animals now existing on the earth, or that have existed during the different stages of creation for thousands of years past will be then discovered. In the blood of a healthy person all the animalcula are quiet and peaceable; but in the blood of a diseased person they are furious, raging, and preying upon each other. That man contains within himself all the principles of the universe; also, that, if a dead cat be thrown into a pool of stagnant water, and allowed to dissolve there, a drop of water taken from any part of the pool, will show as above, every species of animal of the cat kind that has ever existed on the earth, raging and destroying one another, the bodies of all the lower animals being thus made animalcula similar to themselves, and the body of man being compounded of all that is below in the scale of creation."

LOCALITIES FOR BUTTERFLIES.—Will any of the readers of SCIENCE-GOSSIP kindly inform me of any good localities, easily accessible from the north of London (when one has only half a day to spare), for any such species as the following:—*Argynnis paphia*, *A. euphrosyne*, *Melitæa artemis*, *Thecla quercus*, *T. W-album* and *T. Betulæ*, *Leucophasia sinapis*, etc. I should be very glad of information respecting such localities of any of the more uncommon butterflies; I only mention the above as instances. —*A. G. T.*

RUDIMENTS.—It appears to me that Miss Layard is perfectly justified in objecting to Mr. Darwin's use of the word "rudimentary" on the ground that it is not used by him in the generally accepted sense, viz., an early state of a structure to be developed at some future time. "Reduced," or "degenerated," would seem a more appropriate word to apply to an organ, which, undoubtedly in a lower state of development than it once was, has fallen away from that typical form. "Rudimentary" might possibly be correctly used for a structure in a low state of development compared with a higher standard, but at any rate the words suggested would be less misleading. But Miss Layard not only objects to Mr. Darwin's use of the word; she would apparently object just as much if "reduced," or "degenerated," were substituted for it, when applied to any of man's organs. She is "inclined to doubt" Mr. Darwin's statement that our senses are inherited "in an enfeebled and rudimentary (or reduced) condition." Her reason appears to be that in losing keenness our senses have gained refinement and appreciation of variety, that it is "quantity *versus* quality." This is indisputable, but does not the mere fact that they have lost keenness, justify the statement that they are "enfeebled"? Again, why is it "strange" that we should seek "for the perfection of our so-called rudimentary organs in the lower animals"? Does not evolution include retrogression as well as progression in development, and has not man retrogressed so far as his "so-called rudimentary organs" go? Miss Layard says:—"If we are driven to defend the down on the human body, and even the os coccyx, we shall find the same argument to hold good" (viz., "quantity *versus* quality"). And again, "the tail is the rudimentary condition of the *more perfect* shortened formation." What "quality" does Miss Layard find in the os coccyx to compensate for the "quantity" in the tail? And how can a structure, such as the os coccyx, which is so degenerated as to have no function at all, be "more perfect" than one which in many cases has distinct functions? I suppose Miss Layard would assert that the muscles of our arms and chest, for instance, are "more perfect" than those of a gorilla's. Have not these organs fallen away from the typical standard exemplified in the lower animals? It seems to me that Miss Layard regards the organs of man, in all cases, as perfect types, and judges the rest of the animal world by the standard she has set up; whereas, in reality, we do not find, and cannot expect to find, all the typical forms of organs concentrated in one being. Because man is, taken as a whole, the most perfect animal known, surely he cannot maintain that each organ he possesses is, *per se*, more perfect than any corresponding one through the whole range of the animal kingdom. —*A. G. Tansley.*

YEW TREE POISONING CATTLE.—Mr. Lett's note (SCIENCE-GOSSIP, p. 49) calls to memory a similar case, illustrating the poisonous nature of yew-tree leaves, in Leicestershire in the year 1882. During the night eighteen head of cattle, out of a herd of forty, managed somehow to partake of them; but, if taken with three or four times the quantity of their usual food, the leaves of the yew-tree are innoxious.—*C. E. Stott, Lostock.*

V. ATALANTA IN 1887.—My experience does not coincide with your correspondents' from Dundee, Malvern, and Eastbourne in reference to this butterfly. It seemed very plentiful in this neighbourhood. I noticed large numbers in a garden here settling on some sunflowers. A very large proportion of the specimens seemed much below the average size. Would the very dry summer affect them in this way? —*C. S., Penarth, near Cardiff.*

FEEDING FROGS AND NEWTS.—In giving my experience of the food habits of the above, I did not intend it to be understood that I habitually feed my green-tree frogs on earth worms, although I can safely state that I have had them seize and swallow small specimens with avidity. Mr. Finch has no doubt mistaken my meaning, owing to an oversight in leaving out the words "common frogs," in connection with "newts, salamanders, and green-tree frogs." I had the idea that the heading, "Feeding frogs and newts" would sufficiently convey my meaning. I was endeavouring to answer the query of a previous correspondent, and no doubt he would understand that I was referring to our common British species, which is so totally unlike the beautiful little *Hyla arborea* of the continent as to render it a matter of impossibility to confound the two. My salamanders are also very partial to slugs, as well as earth worms, which certainly do not "invariably make their escape while their enemy is making up his mind which to take;" I have known them to swallow three or four earthworms in a very short space of time when hungry; as a matter of fact, I think the latter would come off

second best in a race with a good lively slug.—*A. J. Jenkins, New Cross.*

FOUR-FOOTED BIRD.—The following paragraph was taken from a well-known weekly newspaper about a year ago. "An American naturalist, Mr. Em. Brigham, has announced the discovery of four-footed birds on the Anabija river, in the island of Marago, at the mouth of the Amazon. Curiously enough, the bird scientifically called *Opisthocoma cristata* is four-footed only in early life, and after a few days one pair of legs develop into wings. The bird . . . frequents the beds of 'aninga,' a semi-aquatic plant, and rarely flies far from its peculiar haunts." I am not a student of ornithology, and this seems hard to swallow."—*A. G. H.*

NOTES FROM SOUTH AUSTRALIA.—I have lately come out here, and shall be very glad to have exchanges etc. with you for such things as I can procure here, and I'll be glad to know what you wish me to do for you. Anything interesting to an amateur photographer, either in way of reading or appliances will be very acceptable; mine is full plate with ¼ and ½ carriers. On my arrival here in October it was something magnificent to see the Orchidaceæ of the hills in bloom, and all the shrubs in endless variety and of exquisite beauty, even grasses were in themselves sufficient to call for unreserved admiration. Oh how I wished I could have sent collections to my various English correspondents, as I used to when at home in the hills of Burren, co. Clare, and I hope I will next season be able to do so. There are such lovely orchidaceous plants in every shape and colour (yellow, blue, white, brown, copper, etc.), and as for bulbous plants they are innumerable. One very pretty thing I saw under shrubs and shady glens was, *Drosera Menziesia*, a bulbous-rooted D., size of a marble, with a crown of spathulate leaves on the surface, from which rose a zigzag spike, on top of which four or five flowers, size of 6*d.* (white with lovely pink spots), the stem 18 inches, covered all along with small cup-shaped leaves, studded with crimson and pink tentacles; it is a semi-trailer, and holds itself upright by the curling of the little leaf-stalks round the twigs and grasses, in the way of the nasturtiums. If two or three happen to grow together, the effect, in the sunshine, is something to remember, as they clasp each other and become quite a pillar of sparkling jewels. These bulbs, I trust, I shall be able to introduce to my English friends, and shall be glad if you mention me to yours, or insert any portion of this in your journal and oblige me very much.—*T. McGann.*

SPIDER'S CONTRIVANCES.—Referring to a spider's contrivance "explained by G. E. G. in the SCIENCE GOSSIP," I found several similar instances at Bürgenstock on the Lake of Lucerne, but instead of a fragment of stone sometimes a piece of clay was employed. This plummet was so far distant from the spider's web above, that I had no means of arriving at the clever and probably truthful explanation given by your correspondent.—*J. Lawrence Hamilton, M.R.C.S.*

TOADS SPAWNING.—On Saturday April 14, I observed a large number of toads in a ditch on the Lea marshes near Clapton. I counted no less than nineteen breeding, and could have seen many more in all probability, had I used my net. I captured a group of five, all closely clinging together. In my net, one old toad detached himself from the mass, apparently in a great rage, and bit vigorously through the muslin, which however he did not injure. The remaining toads were making a queer noise, something between croaking and squeaking. When I had repeatedly shaken the net, they very reluctantly left each other, and then, to my surprise, I found that the centre of attraction was a large frog. I was unable to see whether it was male or female. I should like to know whether any instances are recorded of toads breeding with frogs. My experience is that as a rule toads do not begin to breed until the frogs have ceased to deposit their spawn; I should like to know whether this is a fact, and also whether toads croak. I have always studied the habits of frogs and toads, and consider the latter to be by far more interesting and intelligent than frogs, green or otherwise. They are also much more easily kept alive. I have had one in my possession since Sept. 1884, and he is quite tame.—*James Holloway.*

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.

J. B. M. (Longsight).—Your "Exchange" was an advertisement, and could only be inserted as such.

E. P.—You will find a fuller general account of the Norfolk and Suffolk crags than could be given in Dr. Taylor's Address, in his "Geological Stories" ('Story of the Crags'), and a still more extensive account in his 'Geology of Suffolk,' in White's "Suffolk Gazetteer and Directory."

E. W. MATHERS and A. G. H.—See Rutley's "Elementary Manual of Mineralogy," 2nd ed. Also various papers on the subject in SCIENCE-GOSSIP. The fullest information, however, is in Mr. Teall's work on Petrology.

J. S. H.—Your alga appears to be a species of Batrachospermum. Dr. M. C. Cooke is now publishing, in parts, a work on British freshwater algæ.

J. H. JAMES.—The "Selborne Magazine" is published by Eliot Stock, 62 Paternoster Row, E.C.

R. C. C.—You will be able to get sheet indiarubber by ordering it through any apothecary. See articles on "Double Staining," in SCIENCE-GOSSIP, vol. for 1875.

EXCHANGES.

SHALL be glad to correspond with persons interested in Australian Orchidaceæ, and other plants and seeds for cultivation, &c.; also in microscopic slides and material, &c. Exchange photographic and scientific books and journals.—T. McGann, Kaumantoo, South Australia.

WANTED, mineral specimens, fossils, foraminiferous materials, echinoderms, &c., and mounted slides. Will give good exchange.—J. H. Cooke, 178 Prince of Wales Road, Sliema, Malta.

I SHALL be glad to meet with a correspondent in conchology, with a view to occasional exchanges. Will exchange shells of this district and others for land or freshwater shells, British or foreign, also marine.—J. Russell Weldman, 14 Hargher Street, Burnley, Lancs.

CURIOUS old compound microscope, by Martin, date about 1843, fitted in cabinet with six object glasses, two liberkuhns, stage forceps, ten ivory slides, eighty-three glass slides and fourteen wooden ditto, and various other appliances; originally cost £50. What offers?—R. H. L. James, Watford Vicarage, Herts.

DUPLICATES.—*Sph. rivicola, D. polymorpha, N. fluviatilis, V. piscinalis, P. nitidus, Helix sericea* and *caperata, B. obscurus, C. tridens*, and many others. Wanted, *B. Leachii*, and varieties of *Helix hortensis.*—F. C. Long, 8 Cog Lane, Burnley, Lancashire.

WILSON'S "Bryologia Britannica."—Wanted, a good copy of Wilson's "Mosses," in exchange for handsome microscope by Mathews, Carey Street.—Dr. Roberts, Bryntêg, Menai Bridge.

P. glaber, *L. peregra*, and *H. arbustorum*, in exchange for land and water shells and fossils.—Albert Walton, 44 Canning Street, Burnley.

DUPLICATES.—*S. pubis*, *S. elegans*, *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *H. aspersa*, *H. Cantiana*, *H. virgata* (var.), *H. ericetorum*, *H. rufescens*, *H. caperata*, *H. rotundata*, *C. lubrica*, *C. rugosa*, *C. minimum*, *L. stagnalis* (var. fragilis), *L. truncatula*, *B. tentaculata*. Wanted.—*H. Cartusiana*, *H. concinna*, *H. revelata*, *H. obvoluta*, *H. pygmæa*, *B. montanus*, *P. secale*, &c.—Chas. A. Whatmore, Much Marcle, Herefordshire.

WANTED, Rimmer's "Land and Freshwater Shells," or any other good book on conchology, in exchange for Lyell's "Students' Elements of Geology."—Chas. A. Whatmore, Much Marcle, Herefordshire.

FOR exchange, *P. glaber* and others for British land, freshwater and marine shells, or foreign specimens.—W. Dean, 50 Canning Street, Stonyholme, Burnley, Lancs.

FOREIGN butterflies. Many fine duplicates in Orn., Papilio, Morpho, and other orders; also wings of brilliant species, such as *P. paris*, *U. rhypheus*, *M. menelaus*, &c., for microscopic work.—Hudson, Railway Terrace, Cross Lane, near Manchester.

TO Egg Collectors.—I shall be glad to exchange for side-blown, one-hole, authentic eggs of British birds, clutches preferred.—J. B. Young, 2 Elgin Villas, Rodwell, Weymouth.

WHAT offers in good scientific books, &c., for "Knight's Encyclopædia, 27 vols., complete, in good condition (cost about £10); Ward, Lock and Co.'s "Universal Instructor," in 3 vols. (new); Kingsley's "Glaucus; or, wonders of the Sea-shore" (with coloured plates), new?—H. Parrit, 103 Camden Street, London, N.W.

WANTED, dragonflies from all parts of the British Isles; common species acceptable. Natural history books and specimens offered in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

LINDSAY'S "British Lichens," Stark's "Mosses," Gosse's "Naturalist's Sojourn in Jamaica," Rymer Jones's "Aquarian Naturalist," &c., offered in exchange for good works on natural history, Kentish books, works on coins, or microscopic accessories.—C. A. Grimes, Dover.

SNAIL shells.—Wanted, a number of specimens, with or without the animals, of commoner species of Helix, Zonites, Clausilia, Bulimus, &c. Will send box of cover glass in exchange.—G. H. Pickering, 13 Balfour Road, Highbury, London, N.

WHAT offers for five gerbilles, full grown, size of small rats; very hardy; very little smell; easily tamed—worth 5*s.* each at "Zoo'?—Ernest Robson, Dalton, Huddersfield.

WOULD any readers of SCIENCE-GOSSIP kindly assist a teacher in forming a school museum by sending him anything suitable in natural history, &c.?—T. W. Paterson, West Fountainbridge School, Edinburgh.

SPECIES and varieties of Sphærium and Pisidium wanted from any locality; good exchange given in fossils or other shells.—H. E. Quilter, 4 Cedar Road, Leicester.

MAGNESIAN limestone, liassic, and other fossils; also land and freshwater shells offered for fossils, &c.—John Hawell, Ingleby Vicarage, Northallerton.

WANTED, ammonites from any formation.—John Hawell, Ingleby Vicarage, Northallerton.

OFFERED:—"Historia Muscorum Dilleni," 1741; "Bridel Brideri Bryologia Universa," 2 vols., 1826; "Muscologia Hibernica Spicilegium," by Dawson Turner, 1804; "Acharius Lichenographia," 1810; all well bound, clean, and good as new, with plates complete. Wanted, first-class work on marine algæ, and zoophytes.—J. Miles, 26 Sudely Place, Kemp Town, Brighton.

WANTED, two original Jubilee sixpences; will give the following micro-slides, Watson's mounts, in exchange, viz: group of diatomaceæ, *Actinocyclus ralfsii*, anchors and plates of synapta, arranged; foraminifera from Adriatic Sea, transparent; and selenite, blue and yellow; or would give a Mallwood's finder, in case.—Mathie, 127 Buchanan Street, Glasgow.

OFFERED, "Antiquary," 12 parts for 1880; "Entomologist," 36 parts for 1882–4. Wanted, "Geology: Chemical, Physical, and Stratigraphical," by Prestwich (Oxford, 1888).—J. Smith, Monkredding, Kilwinning.

WANTED, to borrow slides suitable for micro-photography; prints given in exchange.—Edward Goodwin, Canon Court, Wateringbury, Kent.

OVER 1000 species (many very rare) of British and foreign shells offered in exchange for others (recent or fossils) not in collection. Foreign correspondence particularly desired.—Miss Linter, Arragon Close, Twickenham.

FOR disposal, four plants of man orchis and two of large butterfly orchis, latter showing flower buds.—W. H. Lowe, 24 Brodie Road, Guildford.

WANTED, to exchange British for North or South American plants. I have about 700 species which are not native in North America. Printed list sent on receipt of address.—H. Fisher, 26 Stodman Street, Newark, Notts.

LAND and freshwater shells (British) in exchange for fossils, dried plants, microscopic slides, or shells not in collection.—W. Crossley, 15 Barker Street, Cornholme, near Todmorden, Yorks.

WANTED, *Mactra subtruncata*, *Capulus Hungaricus*, *Pleurotoma turricula*; many others to offer in exchange.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

FIFTY-THREE 1*s.* parts of the "Intellectual Observer" (with coloured plates), 1862–6; also "Gardening" (illustrated), from March 1886 to Dec. 1887, unbound, in exchange for diatom or other micro-slides.—W. E. Harper, Norfolk Road, Maidenhead.

LOW-POWER microscope with five object glasses (Lennie, Edinburgh), in exchange for British beetles, or good work on same.—W. Wallace, 28 Watson Street, Aberdeen.

MARINE algæ.—Correspondents wanted with a view to exchange of specimens.—W. Wallace, 28 Watson Street, Aberdeen.

THE Italian Microscopical Society (Acireale, Sicily) is forming a library and a cabinet of slides, and will be very much obliged for anything donated to it. Address—The Italian Microscopical Society, Acireale, Sicily.

WANTED, skins of wryneck, marsh and cole tit, shrike, pied flycatcher, rock pipit, redstart (male), whitethroat, garden, reed, marsh, and grasshopper warblers, chiffchaff. Offered, equivalent in odd numbers of SCIENCE-GOSSIP, "Scientific Enquirer," "Nature," and "Naturalist's World."—J. H. K., 18 Church Street, Commercial Street, E.

FOR exchange, several species of British birds' eggs. List on application. Wanted, British and foreign land, marine and freshwater shells, named and localised, or fossils.—Ernest A. Meyers, Richmond House, Hounslow, W.

WANTED, *Murex trunculus*, L.; British land and freshwater shells in exchange.—Ernest O. Meyers, Richmond House, Hounslow, W.

FOR exchange, fifteen species of Cypræa, unnamed and unlocalised. Wanted, eight species of named and localised British or foreign marine shells not in collection, or plants.—Ernest O. Meyers, Richmond House, Hounslow, W.

Clausilia rugosa (var. tumidula) in exchange for varieties and band-variations of *H. nemoralis* and *hortensis*.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, named foreign shells in exchange for British species or tertiary and chalk fossils.—Fredk. Stanley, M.C.S., 6 Clifton Gardens, Margate.

WANTED, exchanges in British land, marine and freshwater shells; have numerous duplicates in each class. Lists exchanged.—Fredk. Stanley, 6 Clifton Gardens, Margate.

WANTED, secondhand photographic enlarging apparatus. State size and particulars.—J. Bates, 20 Lord Street, Burnley.

P. glaber and others in exchange for other land and freshwater shells, British or foreign.—J. Bates, 20 Lord Street, Burnley.

FORAMINIFEROUS material, dredged in Belfast Lough, in exchange for mounted foraminifera.—Rev. H. W. Lett, Aghaderg Glebe, Loughbrickland, co. Down.

WANTED.—Exotic, British, or foreign Lepidoptera; land and freshwater shells, and gault fossils offered in exchange.—A. H. Shepherd, 70 Brecknock Road, London, N.

WANTED, specimens of dragonflies (Odonata) from all parts of the world. Will send in return N. American insects of any order.—Philip P. Calvert, Entomological Section, Acad. Nat. Sci., 19th & Race Sts., Phila., Pa. U.S.A.

NESTS and eggs of humming birds, and other rare eggs, in exchange for clutches of rare British eggs.—W. Wells-Bladen, Stone, Staffs.

BOOKS, ETC., RECEIVED.

"Geology for All," by J. Logan Lobley (London: Roper & Drowley).—"The Microscope."—"Scientific News."—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News."—"Wesley Naturalist," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: H. E. H.—J. H.—A. E. P.—A. B.—I. S.—W. J. H.—J. R. W. —G. P.—W. G.—W. J. H.—J. H. C.—R. H. L. J.—Dr. B.—P. H. G.—T. T.—R. H. A.—E. T. B.—H. W. P.—J. H.—G. C.—A. C. G. C.—W. J. R.—J. H.—J. B. Y.—J. L. H.—W. D.—A. B.—H. F.—H. P.—P. F. G.—T. McG.—C. A. W. —I. B.—J. B.—F. S.—Rev. R. C. C.—E. O. M.—J. H. K.—P. B. M.—S. C. H.—W. H. B.—E. M., jun.—H. W. L.—G. P.—W. E. H.—H. F.—W. W.—W. J. J., jun.—W. C.—W. H. L.—J. E. L.—H. T.—E. G.—J. S.—W. M.—J. M.—J. H.—T. W. B.—H. E. Q.—E. R.—G. R. G. H. P.—C. A. G.—W. G.—E. G.—G. T. W. N.—F. C. L.—Dr. R.—A. J.—J. J.—R. L. M.—B. H.—E. G.—Dr. A.—W. C.—E. P. —J. B. M.—E. H. V.—P. H. C.—W. W. B.—H. G.—A. H S. —A. J. H. C.—G. H. W.—&c.

A BOTANICAL EXCURSION IN SWITZERLAND.

AFTER a few days botanising at Bex about the middle of May last year, we found that vegetation in the mountains behind the village was not sufficiently advanced for us to add many plants to our collections, and so we decided to make an excursion to the warm upper Rhone valley for the three days that remained available.

Making an early start and catching the first train, we arrived at Martigny at seven, and while breakfast was preparing in the humble but very comfortable inn near the station we looked over some rough ground close by and gathered *Sisymbrium Sophia* and *Echinospermum lappula*. Breakfast over, we started about eight for Branson, some three miles off, each carrying a good-sized package of drying-paper, for in so hot a locality, where even so early in the year the thermometer stood at mid-day at 86° in the shade, plants soon wither if kept long in the vasculum.

En route, *Euphorbia Gerrardiana*, *Hippophaë rhamnoides* and *Salix triandra* were gathered on the banks of the Rhone, then *Hyoscyamus niger*, and at the foot of the hill, near Branson, *Medicago minima*, *Silene otites*, *Sempervivum montanum* and *arachnoideum*, *Thalictrum minus*, *Orlaya grandiflora*, and *Helianthemum Fumana*.

To give a good idea of the vitality of the Sempervivums, a root was gathered here not yet in flower, which after remaining over three weeks in the vasculum flowered when planted in a London garden. Arrived at Branson, we deposited the paper in a small inn and mounted the hill. *Helianthemum salicifolium*, *Vulpia pseudonymus*, *Dianthus sylvestris*, *Orchis eriophora*, *Carex nitida*, and *Herniaria glabra* were quickly found, then *Anemone montana* and, further on, at the corner of the hill round which the Rhone turns northward, *Adonis vernalis*, not yet in flower, *Oxytropis Halleri*, *H. pilosa*, and *Biscutella lævigata*, all in fruit. Descending to the foot of the hill several Salices were found, and then remounting the rocks, which by this time were quite hot to the touch, we found *Vicia onobrychioides* and *V. tenuifolia*, both allied to our *V. cracca*, but the former of the two with larger and fewer flowers on the stalk *Onobrychis arenaria*, *Astragalus onobrychis*, and *Potentilla recta*. Further on, in a vineyard, *Ajuga Genevensis*, and then above Branson, in a rough pasture, *Lathyrus sphæricus*. Descending to the village, we emptied our vasculums, which by this time were quite full, and arranging the plants in paper we shouldered our packs and started off for the next village, Fully. En route we gathered *Herniaria ciliata*, *Trigonella Monspeliaca*, *Eruca sativa*, *Ononis altissima*, *Bunias erucago*, and a crucifer with enormously long flower-stalk, *Calepina corvini*. The last two named are natives of a more southern latitude, which have found a congenial resting-place in this hot valley. In a wood above Fully we gathered *Veronica teucrium*, *Astragalus glycyphyllos*, and *Vicia pisiformis*, the last unfortunately not in flower. At Fully we tried in vain to get something to eat, but were obliged to content ourselves with a little fairly good red wine, and started off quickly for Saillon, some few miles further on. Our route now lay only the right bank of the Rhone and yielded very little of interest. Near Saillon we stopped a short time to look at some recently opened quarries of a stone called Cipolin. High up the rocks was a small black speck, the mouth of the quarries from which enormous blocks of stone are brought down on a tramway, that from below looks almost perpendicular. At the foot of the trams are the workshops where the stone is worked up into mantel-pieces, monumental stones,

and other articles of this description. Though the quarries have only recently been opened, a very considerable industry has already sprung up in the stone, which somewhat resembles marble in appearance.

Soon afterwards we reached Saillon, and on the castle hill gathered *Scorzonera austriaca*, *Onosma stellulatum*, and *Ononis Columnæ*, the latter not in full flower; and, descending to the town, *Isatis tinctoria*. We now crossed the Rhone, and near the banks gathered *Orchis latifolia* and *Camelina sativa;* and then, after a weary tramp along a straight shelterless road for some two miles, reached Saxon. Here we were more fortunate than at Fully, and after some luncheon, finding there was still a good time before the departure of the afternoon train to Martigny, we strolled through the town. The baths still attract a considerable number of visitors, but before the suppression of the gambling-tables the village must have been a very lively place in the season. Behind the village rises a range of mountains, the best known peak of which is the Pierre-à-voir (8123 ft.), a famous point of view. On the flanks of this range we gathered *Adonis vernalis*, covering a large space with its beautiful golden flowers, and *Veronica prostrata*, and then returned to the station and took the train to Martigny, where we arrived in time for dinner, very tired, but well satisfied with the results of our first day. Rising early next morning, we mounted the hill near the station, gathering *Sisymbrium Thalianum*, *Onosma stellulatum*, *Allium vineale*, and *Helianthemum Fumana*, and a few others, and descended in time for breakfast and to catch the 7 A.M. train for Riddes, where we left the train, sending our baggage on to Sion. Our route now lay along the left bank of the Rhone, and before long yielded us *Typha Laxmanni*, a beautiful little plant, *Carex vesicaria* in swampy ground, and on the cliffs to our right *Diplotaxis tenuifolia;* out of easy reach grew *Ononis rotundifolia*, but our day's journey was to be too long a one for us to delay to climb after it. Before long we gathered *Dracocephalum austriacum*, a beautiful Labiate plant with large purple flowers, growing in a locality recently discovered, and almost the only one now left in Switzerland. Along with it grew *Thalictrum fœtidum* and *Veronica prostrata*. Here we rested for a while under some fine walnut trees, chatting with a well-to-do peasant who owned a considerable extent of land covered with well-grown fruit-trees. Starting off again, we tramped for about two hours along the bank of the Rhone, a most unpleasant walk—fine white sand in which the foot sank deeply at each step, a broiling sun and not a breath of air, and what is more, not a single interesting plant to enliven the way. Crossing the Rhone opposite Vetroz, we gathered *Hieraceum lanatum*, growing amongst the stones of the embankment, and shortly after, *Ephedra distachya*, *Helianthemum Œlandicum*, *Ononis rotundifolia*, *Achillea setacea*, and *Sclerochloa dura*, but our search for *Androsace maxima* was fruitless. Passing over Montorge, a hill on the road to Sion, we found *Arabis turrita* and *Amygdalus communis*, the latter growing in what to me looked suspiciously like an abandoned garden. It was now a good deal past midday, and we were almost done up with the heat, so we descended into Sion, and sending for our traps from the station, pressed our plants while dinner was preparing. Later on we strolled up the hill on which the old Episcopal castle is built, we gathered *Vicia lathyroides*, *Veronica verna*, and *Allium sphærocephalum*, and then back to the town to discuss plans for the next day. After feeling much tempted to search for *Cypripedium calceolus* and other plants on the hill on the opposite side of the valley, the knowledge that several rarities were to be had at the entrance of the Visp Thal, leading to Zermatt, decided us to proceed thither. Foolishly we postponed our departure till the first train next morning, and thus shortened by several hours the last day of our excursion. It was nearly ten when we alighted at the Visp station, and already very hot, so we lost no time in starting off in search of the two specialities we had in view—*Arabis auriculata* and *Silene vallesia*. Our hopes of finding the latter were soon destroyed, as we saw plants growing in a garden at Visp which showed no sign of flower. Soon after leaving the station we found *Erysimum Helveticum*, *Daphne alpina*, *Juniperus Sabina*, *Arabis saxatilis* and *A. muralis*, *Hutchinsia petræa*, *Hieracium pictum*, and several other species of this difficult genus, *Viola arvensis*, var. *minima*, and *Salvia officinalis*. Near Stalden were gathered *Crupina vulgaris*, *Veronica triphyllos*, *Trigonella monspeliaca*, *Saxifraga tridactylites*, and after looking longingly up the valleys leading left and right to Zermatt and Saas respectively, we retraced our steps to Visp, and took the evening train back to Bex.

It will be understood that in this brief account of a three days' excursion, all the plants seen are not named, but only those which we had not previously gathered. Nor would any stranger to the valley be able in so short a time to find all the species mentioned, but one of us having visited the neighbourhood on a previous occasion, was able to find many of the localities without much difficulty.

H.

NOTES ON THE EIGHTH EDITION OF THE LONDON CATALOGUE OF BRITISH PLANTS.

By Arthur Bennett, F.L.S.

[*Continued from page* 131.]

1673 is 1520, 7th ed.
1673 *d* is a var. with aristate glumes.
1674 is 1521, 7th ed.

1675 is 1522, 7th ed., alter name to discolor R. et S.

1676 is 1523, 7th ed.

1676 *c* is a var. found by Mr. Melvill in Perthshire.

1679 is 1526, 7th ed., but alter name to *T. pratense*, Pers.

1681 *c* is a long-leaved var.

1684 is 1531, 7th ed.

1685 is 1483, 7th ed., alter authority to Koel.

1686 is 1534, 7th ed.

1687 *b* is a var. found in the Isle of Wight, as also var. *c*.

1688, alter authority to Ard.

1688 *b* is an Irish var. of the plant, with a different facies to the Scotch plant.

1961 *c* is what has mostly been reported as *K. albescens*, DC. I have seen true *arenaria* from the Channel Isles and the Kentish coast.

1692 *b* almost explains itself, as a depauperate var.

1693 *b* is a small maritime form of the plant.

1707 *b*, alter to *cæsia*, Gaud.

1707 *b*, *c*, *d*, are described in the 3rd ed. of "English Botany."

1708 *b*, *c*, two vars. described by Parnell in his "British Grasses."

1710 *b*, *c*, *d*, three vars. described in the 3rd ed. of "English Botany."

1711 *b*, "English Botany." *c*, Parnell's book.

1713 *c*, described by Mr. Townsend in his "Flora of Hampshire."

1715 *b*, Parnell's book. *c*, Mr. Townsend's "Flora of Hampshire."

1718 is 1546, 7th ed.

1719 is 1547, 7th ed.

1720 is 1548, 7th ed.

1725 *b* is 1569 *b*, 7th ed.

1727 is very rare. I have seen only one gathering named by Professor Häckel. But the whole of our Festucæ require gathering in good examples and with roots.

1728 may be held the same as 1570 *a*, 7th ed.

1730. The vars. should stand thus :

a. genuina.
b. pseudo-loliacea, Häck.
c. loliacea (Curt.).

1733, alter name to *ramosus*, "Huds."

1734 *b*, a hairy var. I have it from Kent and Norfolk.

1741 *c*, described in Parnell's "Grasses."

1742 *d*, scarcely differing from var. *b*.

1746, vars. of a very varying species.

1749 is 1587, 7th ed.

1750 is 1588, 7th ed.

1750 *b* and *c*, described in 3rd ed. "English Botany."

1751 *b* and *c*, described in 3rd ed. "English Botany."

1752 is the plant usually named *Triticum acutum*, DC., but which name has been denied to it by two excellent critical botanists of Europe. At present it is doubtful how to name our plant, and also doubtful whether we have the true plant of De Candolle.

1757, alter to *secalinum*, Schreb.

In the ferns the species and vars. are taken from the 3rd ed. of "English Botany," they not having been published when the 7th ed. was compiled, which was "adapted to Mr. Syme's 'English Botany.'"

The sequence of the genera from Hooker.

1803, the name alter to *calcarea*, Fée.

1811 *b*, *c*, two added vars.

1816, added species found by Mr. W. H. Beeby in Surrey ; on the continent, by some authors supposed to be an hybrid between 1815 and 1817.

1819 is a rare Irish equisetum.

1829 *b* is a tall var. from Lough Bray in Ireland, described in "Journal of Botany."

The Characeæ are adapted to the various careful publications of the Messrs. Groves, who have done much to elucidate our British species.

It is hoped that these notes will, to some extent, clear away some of the difficulties in using the 8th ed. of the Catalogue. Very much yet remains to be done to record the distribution of our flora, though Mr. Watson's works have gradually built up a mass of solid information, to which future workers can add. The writer of this will be glad to receive notices of plants found in any county not recorded in 2nd ed. of "Topographical Botany," accompanied by specimens, which will be returned if required.

Many of the writers on botanical subjects in SCIENCE-GOSSIP do not seem to belong to either of the Botanical Exchange Clubs, or to the Botanical Record Club ; hence permanent records of their finds may not be made ; all can help, and it is only by the aid of many that the flora of a county can be kept up to date.

I shall be glad to see any observations in SCIENCE-GOSSIP on these notes, and will do my best to further explain any seeming anomalies.

I have not touched on the exclusion or inclusion of introduced species, as this may form a pretext for endless disputation.

One of the gravest objections that have been made is this : "Where are we to find these new species and varieties described ?" The fact is this, the Catalogue is ahead of any Flora ; hence some difficulty will be experienced until one or the other of our standard Floras is published in a new edition.

(*Concluded.*)

STUDIES OF COMMON PLANTS.

THE MARIGOLD (*CALENDULA.*)

By E. A. SWAN.

THIS plant belongs to the order Compositæ. The flower is curious and interesting. Two whorls of sepals form the involucre, two or more whorls of petals the ray florets, and a numerous company of closely packed blossoms the disc. The involucre fits

very closely, ensuring a compact barrier against the intrusion of insects from without; and the two sets of sepals are placed alternately and are well provided with hairs on their margins.

The ray florets, which present an attractive circle of bright yellow, are unisexual, possessing the female organ only; but this is perfect, and in due time receives the pollen which fertilises the seed, the latter being contained in an achene of semicircular shape at the foot of each floret.

The blossoms are in three parts. Within these is a barren pistil; next, and surrounding it, five stamens joined at the upper part so as to form a tube; and, outside all, a monopetalous five-lobed corolla. The barren pistil ends in a blunt stigma, of a somewhat pyramidal shape, covered with short spines. Its office appears to be to raise the pollen by brushing it off the anthers.

Fig. 58.—Part section of complete flower.

The order in which the important organs come to maturity is as follows:— 1st. The anthers discover themselves just above the corolla, hitherto closed. 2nd. The barren stigma is observed gradually thrusting itself upwards till it stands displayed. 3rd. The fertile pistil of each ray-floret shows slightly above the level of the disc and then divides at the top; previously it was concealed between its particular floret and the nearest outside blossom of the disc. To sum up, the disc blossoms mature in regular order, beginning from the outside, and when one or more rows are matured, the fertile pistils become faintly visible. Cross-fertilisation is secured by the above arrangement, because, when the first pollen is available, there is no fertile pistil whereon it can be deposited. An insect, therefore, after brushing off pollen, will probably carry it to some other flower, possibly on another plant, where the fertile pistil has appeared.

I am inclined to believe that fertilisation is largely carried on by very small insects that crawl bodily into each corolla in search of nectar; and, inasmuch as they first attack the corollas on the outside of the disc, they are likely to rub their bodies against the fertile pistils. I am confirmed in this opinion by the fact, that the fertile pistils barely disclose themselves above the disc, so that a large insect would rarely if ever touch them. I observed a minute beetle about $\frac{1}{10}$ of an inch long to be a constant visitor, and I have frequently seen it almost bury itself down a corolla. No doubt its action had the effect of pushing down the anthers and thus helping the stigma to rise. I think that, if it were not for these insects and others acting in a similar manner, fertilisation would never take place. Again, the formation of the entire flower is in favour of the supposition, that small insects alone are concerned in the important process; for, if the duty had to be performed by large ones, it is most likely that each blossom would have been a perfect flower, and then a large insect when thrusting its proboscis down the corolla would, at the same time, press against a fertile pistil. The habit, too, of the complete flower closing up at night points in the same direction; for many large moths fly about then, and their attentions, far from being serviceable, might be positively injurious, as they would, but for this, remove pollen without placing it where required.

The barren stigma is a singular feature. It is an instance of how a part may be made to subserve a purpose for which it was not originally intended and modified to suit the surroundings. Without the assistance of this barren stigma, it is doubtful whether pollen would ever be separated from the minute anthers and raised to a position to be available for visiting insects.

The figure represents a part section of a complete flower, magnified about four times, with only three blossoms a ray floret and a bract left standing, by which some idea may be gained of the method of fertilisation.

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NOTES ON *TRIFOLIUM STELLATUM.*

AMONG the improvements of the last edition of the 'London Catalogue of British Plants' is the inclusion of such of our non-native plants, "as are now thoroughly established and look quite wild." Some of these formerly denominated as "casuals" are thus very properly admitted to our Flora. Mentioning the starry-headed trefoil to a botanist at Kew as occurring at Shoreham, a friend was recently told that it was formerly to be found there; but had long since disappeared. This, I am glad to say, is by no means the case, for on the low line of shingle near Shoreham Harbour this lovely plant exists in profusion. As confined to Sussex, and as having been established in its present locality for nearly a century, a few observations on it may be offered. How it gained its footing on this point of the south coast, and there only, is unknown. The seeds may have been scattered from some wreck, or imported in some of the curious modes of plant distribution described by Darwin. Gerard appears to have been acquainted with it in the sixteenth century; for, speaking of Bauhm's *Trifolium stellatum*, he says "for distinction's sake, I adde *hirsutum*, calling it *Trifol. stellatum hirsutum*," and his description of it is so quaint and

accurate that it deserves quotation. "Rough starrie headed Trefoile; it hath a smal long white root, from which arise stalkes, some foot high, round, slender, hairie and reddish, having few leaves or branches: the leaves stand three on a stalke, as in other Trefoiles, smooth on the upper side, and hairy below, the flowres are small and red, like in shape to those of the common red Trefoile, but lesser, and they stand each of them in a cup-reddish trough below, and on the upper part cut into fine long, sharpe leaves standing open as the commonly figure a starre: the flowres fallen, these cuppes dilate themselves and have in the middle a longish transverse whitish spot. I saw this flowering in May in the garden of Mr. Tradescant, who did first bring plants hereof from Fermentera, a small island in the Mediterranean Sea." It is to be regretted that Gerard gives no figure, as most of his cuts are excellent. Syme speaks of *Trifolium stellatum* as rare and "perfectly naturalised on the ballast along Shoreham Harbour, where it has maintained its position since 1804." In a note in the 'Phytologist,' Borrer describes a visit to its habitat and as finding it there with other species of Trifolium. I have before me some beautiful specimens which he collected, in late flower with the long awl-shaped calyces, densely clothed with silky hairs, and the larger starry heads which render it one of the most lovely species of the genus. At the beginning of June it is in perfection, when the stalked round heads of flowers, in ovate spikes, erect, crowded together display its light pinkish petals surrounded by an environment of white and green. Sowerby's figure of this plant represents the corolla of much too deep a

Fig. 59.—*Trifolium stellatum.*

crimson hue. Freshly gathered specimens (May 24, 1888) show albino flowers, mingled with others of pretty pink, in the heads curved before expansion. Some of our wild flowers are of especial interest as being confined to but a single spot in our island, and of these a sad diminution has sometimes taken place owing to accidental circumstances, or the ruthlessness of collectors. It is to be hoped that such may not be the case with this floral gem.

F. H. Arnold.

NATURAL HISTORY JOTTINGS.

The Green Tortoise Beetle (*Cassida viridis*).

[*Continued from p.* 138.]

August 28th.—This evening, which was dull, moist and mild, I took from a thistle three tortoise beetles that had squatted on the centre of the leaf above, near its junction with the stem. From their colour assimilating closely with the colour of the leaf they were not readily distinguishable, their antennæ and limbs being tucked away beneath the leaf green carapace which entirely covers and conceals the black head and body; they were just like so many green scales lying on the leaves. The surface of the leaves was very much blotched by having had the parenchyma eaten out from above in small irregular patches, and the lower epidermis left intact; and as the tortoise beetle itself eats out the flesh or parenchyma of the leaf (as I have already observed in those evolved within doors), as well as it does its larva, though in a more irregular manner, I am inclined to think that it has been the agent of this state of the leaves on this particular plant.

As I have taken the imago from the foliage of thistles as early as June 25th, and again on July 20th, and the full-grown larvæ (accompanied by younger larvæ) not before the second week in August, it would appear that the tortoise beetle hybernates in the perfect state; when we consider that all those larvæ of the August brood are fully evolved in the autumn, and that the food-plant (should the agriculturist allow it to stand and shed its seed) will die down in the winter, and thus furnish no supply of food to hybernating larvæ of a later brood.

In all its stages the tortoise beetle is well supplied by nature and instinct with the means of concealment and defence. In the perfect or imaginal condition, its form, structure, and colour are such that it can apply itself closely to the foliage of its food-plant, and bear a near resemblance to a green scale (itself not readily distinguished) lying thereon. In the larval condition, its colours are dingy; it is over-shadowed by and concealed beneath its coarse black fecal canopy, which causes it to closely resemble the mutings of those insectivorous birds that affect its haunts; and its low depressed body is completely surrounded by an armament of strong setose lateral spines, which will tend to keep insect foes at bay, and with the hard rough fecal covering it will probably cause birds that may once feed upon the armed larva to consider before again swallowing a morsel that contains more hard, prickly, and innutritious husk than juicy, nutritious kernel. In the pupal condition, the colours are again dingy and dark; the thorax and anterior exposed part of the abdomen are still closely surrounded by spines, whilst the last four segments of the abdomen are encased in the run-together exuviæ of the anterior portion of the larva, and thus more densely than ever surrounded with setose spines; and the posterior portion of the exuviæ, embracing the six hindermost abdominal segments, is thrown up tensely and vertically, and the anal appendages are thrown apart fork-like and horizontally forwards over the dorsum, by the long fine rigid and elastic anal appendages of the pupa, the whole constituting a densely spinous and elevated anal protection and tail to the insect during this its most helpless stage of existence. Moreover, when even lightly touched, the pupa has the power and habit of suddenly throwing itself up vertically in its anterior three-fourths, and of retaining that position at pleasure. This feat is rendered possible by the manner in which the pupa is secured and retained within and by the larval exuvia: the setose spines of larvahood appertaining to the sixth, seventh, and eight abdominal segments, are now, in the pupa, reduced to mere ridges, and a simple short spine backwardly directed, while the anal appendages (the modified spines appertaining to the ninth and last abdominal segment) are reduced to two long, slender elastic spines; the former, probably, by an outward pressure, aiding in retaining more firmly the hinder portion of the abdomen within its exuvial sheath; the latter, undoubtedly, being the main instruments in mooring the pupa, and sometimes visible within the tensely elevated exuvial tail bent back bow-like; whilst the abdominal exuvial disk remains firmly glued to its seat, and prevents the pupa falling forwards.

Kirby and Spence, in their "Introduction to Entomology," in speaking of the genus Cassida with respect to the remarkable habit of its larvæ in sheltering themselves under a canopy formed of their own fæces, have the following remarks:* "In some species the excrement is not so disgusting as you may suppose, being formed into fine branching filaments. This is the case with *C. maculata*, Linn. In the cognate genus Imatidium, the larvæ also are merdigerous; and that of *I. Leayanum*, Latr., taken by Major-General Hardwicke in the East Indies, also produces an assemblage of very long filaments, that resemble a dried fucus or a filamentous lichen." Again, J. O. Westwood, in "An Introduction to the Modern Classification of Insects," says:† "The larvæ of some of the exotic species of Cassida (*C.*

* Vol. ii., p. 212; ed. 6th, 1843.
† Vol. i., p. 379; ed. 1839.

ampulla, Oliv.), as well as those of the genus Imatidium, are also merdigerous, producing an assemblage of very long filaments, resembling a filamentous lichen. The late General Hardwicke published an account of the transformations of a beautiful East Indian species of Cassida. . . . The larva closely resembles my figure of that of *C. viridis*; but the lateral rays are much longer, and anal feci-fork much shorter."

Now, so far as the British species of Cassida are concerned, the "fine branching filaments" into which the excrement was supposed to resolve itself, are in all probability simply the exuviæ of the branched or setose spines constituting a goodly portion of each section of the fecal canopy, and a much larger proportion of the newly added exuvial platform for its continuation or increment; whilst with respect to the exotic species, as the "lateral rays (spines) are much longer, and the anal feci-fork (anal appendages) much shorter," may it not be possible, nay probable, that the "assemblage of very long filaments, resembling a filamentous lichen," is simply the exuviæ alone, the superaddition of the fæces being unnecessary and undesirable, since the "anal feci-fork is much shorter," and is probably less well adapted for carrying a load of fæces that shall entirely extend over the body of the larva, while the exuvial platform will be larger and more extended, and consequently more protective, owing to the much greater length of the lateral rays or spines.

In the British species of Cassida, a protective fecal dorsal covering being necessary to the well-being of the larva, the reason why it should be elevated above the body, and borne as it is on an organ specially modified for the purpose, rather than the fæces laid directly upon the dorsum (as naturalists inform us is the ease with the larva of the *Crioceris merdigera*), is obvious enough; the spiracles of the flattened larva are situated dorsally, and from the nature of the fæces would at an early period in the existence of the creature become clogged up, and asphyxiation would assuredly ensue; and thus the very means employed by the larva as a protection and self-defence would be converted into a means of self-destruction. This necessity for a self-provided dorsal covering has involved a considerable and remarkable modification in form and direction of the two spines appertaining to the last abdominal segment of the larva, and of the terminal portion of the alimentary canal or intestine, as well as in the direction or pose of the posterior portion of the body; thus the spines are enlarged, completely ehanged in direction (being vertical instead of horizontal), and are furthermore thrown forwards horizontally over the body by the singular earriage of the hinder portion of the abdomen, while the anus, instead of terminating horizontally with the body, is projected far beyond it vertically by an extensive telescopic elongation of the intestine and the erection of the extremity of the body.

It seems somewhat singular that (from Kirby and Spence downwards) our most distinguished and practical naturalists, our instructors and authorities in entomology, who have been attracted by this most remarkable larva and have written about it, and most, if not all, of whom must have handled it, should have missed the true formation and constitution of its artificial dorsal covering; and should have entirely ignored the wonderful modification in form and function of the terminal portion of the intestine—its exsertion, and its prolongation telescope-tube-like and evagination on the passage of the fæces; its remarkable mobility which enables it to assume the most varied forms, and thus to be applied over the entire extent, the length and breadth, of the exuvial platform, so as to suitably dispose the fæces in the construction of its singular canopy; and, lastly, to be used almost, as it were, as an organ of prehension, in aiding in the disposition of the exuvial platform, and in the displacement of the canopy at the close of the larval period. Burmeister, when treating of the artificial coverings of the larvæ of insects, useful as a protection from their enemies, has, at page 506, the following remarks: "We find other coverings in the aphidæ and tortoise beetles, which envelope themselves with a white woolly or fibrous substance, the origin of which we are not yet acquainted with, but it appears to be produced by a peculiar secretion of the skin."* Thus this author even classes the artificial exuvial and fecal canopy of the larvæ of the tortoise beetles with the natural woolly elothing of the aphidæ, which is eertainly an outgrowth from the body of these homopterous insects in all their stages.

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LUNDY ISLAND.

By DR. CRESPI.

VISITORS to Instow and Ilfracombe generally sooner or later are fortunate enough to catch a glimpse of a long, low line far away on the western horizon: that is the tiny Island of Lundy. At a distance of twenty-four miles, it seldom looks more than a nebulous line, slightly raised above the water; but on near approach it is seen to stand up grandly—a vast granite mass, four miles long, three-quarters of a mile wide, and from four hundred to, in one place, over five hundred feet in height. Its configuration is singular; its long diameter points nearly due north and south, while its eastern slopes, precipitous enough to make them interesting and remarkable, are only one degree less striking than its western sides, where walls of rock rise in perpendicular steps sixty and eighty feet at a time. The western side is particularly imposing; and were Lundy more accessible, it would attract tens of thousands of visitors. But Lundy has

* Manual of Entomology, transl. by Shuckard: Lond. 1863.

no harbour at all, and no landing pier or stage whatever, and though the beach, at its south-eastern end, is good as far as it goes, it is not always accessible or safe. Sometimes furious seas roll upon that beach, as though they would wash the island away, and Lundy is then completely cut off from all connection with the mainland, except by telegraph, which of late years has been laid down between Hartland, on the Devon coast, and the south point. Off Lundy the anchorage is excellent in westerly gales, and then, especially if the storm lasts some days, large numbers of fine steamers and splendid ships with whole fleets of skiffs and tugs take shelter under the lee of the island, until, with a shift of wind to the east, they are off to a less exposed spot.

I once lived on Lundy for three years and a half, and after a long residence in great cities and much hurrying to and fro, the contrast was startling. Quiet and leisure I had in abundance; but, cut off from the conflict and competition of life, the inclination to work and to turn my time to the most profitable uses was wanting, and never did I do less, never did I get through fewer books. No! whatever poets may say, the man exposed to the storms and distractions of life works hardest and does the best work. Rural retirement is more fascinating to the imagination than in reality. I used to listen to the piercing shriek of the restless wind, stroll about the island, exchange a few words with the residents, and when evening came I was quite tired enough to feel that I had earned a good night's sleep in return for my arduous labours.

Lundy is in many ways singular; its chief attractions are its configuration, climate, bird-life, and vegetation: to say nothing of its history: not very eventful it may be, but extending far enough back to invest it with some interest. On the south point, overlooking a narrow and dangerous neck of land, connecting the greater mass of Lundy with Lametry, stands a small castle, rugged, ancient, and gloomy, once the stronghold of a Norman baron, and still called "The Castle." Its original lord and builder was a certain De Marisco, which is said to be a corruption of De Montmorency. The island, according to tradition, was granted, centuries ago, to the Knights Templars, who, however, never took possession of it. Then it passed from noble to noble, was the scene of much fighting between Welsh and Irish, and finally, fifty or more years ago, came into the possession, by purchase, of the late William Hudson Heaven, a quiet, amiable country gentleman, who made it his home for years, and there died a few years ago. The present owner is his son, the Rev. Hudson G. Heaven, M.A., formerly of Trinity College, Oxford, an able and accomplished man of scholarly tastes, who has the rare felicity, in the south of England, of being absolute lord of all he surveys, without an equal or rival within many miles.

The top of the island is an extensive and tolerably level plain, sloping somewhat towards the north and east, with no trees, no hedges, and no shelter. This want of shelter is a serious drawback, and from the comparative mildness of the winter and the absence of severe frost, were there only substantial protection, large quantities of excellent early vegetables could be grown for the Bristol markets. Perhaps, were sufficient expense incurred, a good deal of shelter might be made amid the combes on the eastern slopes, and vegetables of excellent quality could be grown a month earlier than on shore. After the end of March, white frost is extremely rare. In March, 1878, the lowest reading was 32° F. and in April 33° F., and in May 39°·5. In March, April, and May, 1879, the readings were respectively 29°·5, 30°·5, and 36°·5 F., and in 1880 in the same months, the minima recorded were 36°·0, 39°·0, and 38°·5. Unfortunately the elevation of the island and the want of shelter from the winds, in some measure counter-balance the signal advantages which the absence of low temperatures would give the island.

The south half has long been cultivated; there the grass is smooth and green, and the crops of superior quality; the northern half is, however, in a state of nature, with shallow soil or bare rock, and more lichen and moss than turf. The slopes of the island, locally called *sidelands*, are, however, in places singularly beautiful and attractive; in others, principally, though not wholly, on the west, they are majestic and impress the few people who have an opportunity of seeing them as *sui generis*. On the slopes, well under the shelter of the mass of the island, and at some distance above the water, the soil is, in places, deep and contained in pockets, where it has accumulated, and there the grass and many species of wild flowers luxuriate, and attain splendid proportions.

The speciality of the island is its wild birds, which once abounded in millions. In those days, when they rose, they filled the air with discordant cries. Long, however, before I took up my residence on the island their numbers had greatly diminished, and though protected, as much as possible, by the squire and his sister, serious inroads have been made upon their numbers, and they no longer rise in the dense clouds reported by earlier visitors. In April the sea birds come in, and speedily almost cover the rocks and the more inaccessible headlands and a little later they commence to lay. The chief species are several sorts of gulls, guillemots, shags, razor-billed auks, puffins, and a few, only, alas! very few gannets, that noblest of British sea birds, darting along like a ray of light far beneath the spectator's feet and not much above the water. It is said, though I cannot vouch for its truth, that Lundy is the lowest latitude in which the Solan goose lays, though Dr. W. F. Ainsworth has seen it flying along in its characteristically majestic fashion, on the coast of Portugal. These sea birds choose open ledges, and most of them, almost of necessity, lay their eggs where daring climbers can get to them. The temptation is too great, and as the work of destruction never

stops, the wonder is that what with the depredations of the birds themselves, who can often be seen sitting in most contemplative and philosophical fashion, with half a huge shell impaled on their beaks, what with the rats, what with the assiduous hunts of the islanders, the sailors and the pilots, any escape. Puffins generally lay their eggs, which are much like those of the domestic fowl in size and shape, though not identical in colour, in burrows, and so many of them escape, and the razor-bills also choose obscure nooks behind the huge masses of rock that have fallen from the top of the island. But gulls and guillemots are less fortunate and far-seeing, and they deposit their eggs in full view of the egg-gatherer, while Solan geese select by preference a few bare ledges, not very difficult to reach, and few, indeed, of their eggs are hatched out. The largest egg is the gannet's, and it usually fetches sixpence in the market, but the most brilliantly coloured is the guillemot's—green, white, or blue. Nests are not made, except rude ones by gannets and gulls, and a little rubbish is scraped together by some of the puffins. Sea birds, in short, do not excel in nest building.

The tameness of the birds at the breeding-season is remarkable, and some of the smaller species actually remain on their eggs until they are touched, and resent any attempt to remove them, opening their formidable beaks, and with right good will snapping at the fingers of the egg-thief. Of all quaint little creatures, none surpasses the puffin with its comical appearance and red colouring, so much more vivid in real life and in its native haunts than in museums, where, however well and skilfully the bird-stuffer does his work, the lover of nature is painfully struck by the contrast, missing that indescribable something which life alone can give. The eggs are not bad when boiled a long time, but they have rather a strong flavour, and are of no use for delicate cooking of a high class; while, as for the flesh of the birds themselves, though not absolutely unpalatable, especially in a meat pie, there is something unpleasant in the thought of eating them, and few are used to satisfy the luxurious appetite of man on our English coasts, though the hardier and less squeamish Scotch do not despise them preserved in salt.

Of land birds Lundy has a larger list than one would expect, blackbirds and song thrushes, robins, white-throats, a few cuckoos, sparrows, chaffinches and other common species being fairly numerous, and in severe weather considerable flocks of tender native birds cross from the mainland. In addition to the above, plovers, curlews, peregrine falcons, Cornish choughs, ravens, crows, goshawks, and buzzards are seen in small numbers, a pair or two of each species residing on the island. The peregrine falcons of Lundy have always been in high repute for hawking, and even at the present day young falcons are sent away for this purpose. An occasional eagle has before now condescended to alight on the island for a brief rest.

Although the rocks look precipitous, and in places rise in abrupt ledges four hundred and even four hundred and fifty feet from the water, long practice and holding a rope in the hand, fastened securely to a crowbar driven into the ground, or firmly attached to a projecting ledge or knob of rock, will enable a cool head and a keen eye to explore almost all the island ledges, comparatively little of the sidelands being altogether inaccessible. Nor is this amusement as dangerous as might be at first supposed, though lives occasionally have been lost. Ladies soon become expert climbers, and find great enjoyment exploring the nooks and crannies of the mysterious bays of the west and north-west.

The population never can have been large, nor can fishing have helped to bring immigrants from Cornwall and Devon. The want of a secure harbour is a fatal drawback, for though the anchorage is excellent, and shelter can generally be found in the roughest weather, there has not been for many years, and perhaps there never was, any place where a small craft could find absolute safety in all states of sea and wind; in other words, vessels could never have belonged to the island and stayed near it. The shellfish is good, and a band of rugged Cornish fisher-folk, from the wild coves of Land's End and Sennen, generally come over for some months every spring and summer, and, with the help of their lobster pots, manage to get large hauls, which they take over to Ilfracombe or Instow for the London market. The fishermen's life is one of great peril and exposure, and intense labour, and its rewards are small; the poor fellows losing their sleep and working like slaves, and often perishing in storms, and all this in return for very poor wages.

The antiquities of Lundy are not remarkable, and, except for the remains of the small castle, there is little to attract the antiquary. Legends there are of a large population in ancient days, of towns, villages, and large churches, but these seem to have little to rest upon. Some brass guns were said to be visible at certain states of the tide on the west side, in the water, but I never saw them, though I often looked for them. Some kistvaens were found many years ago, but no description was made of them, and they are totally gone. A quarter of a century ago, however, some men cutting a tunnel for the foundation of a wall, came upon a curious grave, evidently of great antiquity, containing a skeleton, and the remains of eight or nine other human bodies were lying near. The skeleton in the grave is said to have measured eight feet three, and a second skeleton was also of abnormal size. The improbability that the correct measurements were obtained is so obvious that few people will accept these figures as reliable. A lady residing on the island, though temporarily absent at the time, assured me that no mistake had been made, and that I could accept these figures. Unfortunately the attention of antiquaries was not drawn to the

matter, and the skeletons were buried by order of the late squire in the churchyard. Some rude beads, apparently of glass, were found in or near the graves, and were preserved, and these were submitted to a learned friend of mine: he pronounced them Danish, but of no special interest. The largest of the skeletons was enclosed in a rude stone grave, not, however, a carefully constructed stone coffin, although a stone had been hollowed for the head and another for the feet. If the beads were Danish, it is natural to assume accordingly, that the bodies were probably those of Danes, and a curious question would be whether the Danes buried their dead in the fashion described. Of course the length of the skeletons is startling.

The present population of Lundy is small, and though fluctuating a good deal, rarely exceeds fifty; most are connected with the extensive farm, comprising nearly all the cultivated land of the island, others belong to the lighthouse service, and a few to the squire's family. Accommodation for visitors is scarce, and the squire does not wish his little kingdom to be frequented by strangers. In summer a fast steamer crosses most weeks from Ilfracombe, and stops for a few hours. Difficult indeed would it be to find a spot so cut off from the great world, and so interesting in its way and yet so difficult of access. When I returned to Instow, I used to feel that I was in the bustle of modern life, though the first time I crossed to Lundy, just after a journey to New York and Birmingham, Instow, at which I was kept twelve days, looked like the *ultima thule* of England. Since I ceased to reside there, seven and a half years ago, I have not set foot upon it, and the difficulty and uncertainty as to getting to and leaving Lundy, sufficiently explain my long absence from it, although my interest in it is unabated.

Wimborne.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Magnesium Flash Photography.—This process, divested of unnecessary complexity, consists in obtaining artificial light by simply sprinkling some magnesium dust on gun-cotton, laid on a plate which may be placed on the top of the camera or other suitable position, and when the proper moment arrives the gun-cotton is fired by a match and the negative picture is obtained at once, provided the arrangements are properly carried out. I have lately witnessed its application by an amateur photographer with excellent results, under conditions otherwise hopeless. No glass pavilion is necessary, nor specially painted background. A picture may be taken in any room, and very good effects obtained, provided some artistic taste is employed in the sitting and grouping in reference to furniture and ornaments.

The flame being large, the shadows are not hard, as when an electric light or magnesium wire is used, and they may be still further softened by judicious use of the gas or lamplight in ordinary use. To obtain this softening effect the cap should be removed a little before flashing. This gives what I may call an under ghost, or gaslight picture not visible as an actual picture, but supplying an appreciable effect in softening the outlines. Amateurs may now take home pictures after business hours, at any time in the evening. This is likely to extend very largely the recreative use of the beautiful art.

Another advantage of the flash light is that in portraiture the eye is shown at its best. A strong light contracts the iris, but this contraction is by no means instantaneous. Therefore the flashed photograph represents the eye as it was in the subdued light or even darkness preceding the flash. The sitter may be startled by the flash, but the picture is not thereby disturbed, as the nervous impulse only travels at the rate of about 80 to 100 feet per second, and thus "the twinkling of an eye" is a work of time, a slow process compared with instantaneous photography; the picture is taken before the twinkling has started.

An old Experiment.—In a lecture delivered in April last at the Royal Institution, Sir William R. Grove described an experiment he made in 1856, which is suggestive of further research with the modern appliances of more sensitive plates. He cut letters out of paper and placed them between two polished squares of glass with tin foil on the outsides. The tin foil was then electrised like a Leyden jar, for a few seconds, the glasses separated, the letters blown off, and the inside of one of the glasses covered with photographic collodion. This was then exposed to diffused daylight, and on being immersed in the nitrate of silver bath, the part which had been covered with the paper came out dark, the remainder of the plate being unaffected.

Here we have an effect usually described as photographic in which light is not the artist. Some sort of action is communicated to the silver salt by the electric charge, and it appears to be the same as that communicated by light, but what the nature of that action may be, is at present an absolute mystery, in spite of the imaginary molecular gyrations, oscillations, mean free paths, &c. &c., by which the scientific dreamer conceals his ignorance. If the philosophic modesty with which Sir William Grove has treated these mysteries, from the time of his first publication of 'The Correlation of Physical Forces' in 1842 to the present time, were more general, the prospects of solving them by experimental investigation would be greater.

Crystal-Making.—When a youngster, I amused myself by making saturated solutions of alum in hot water, placing cinders, &c., in these, and setting

them aside to cool. The cinders became coated with beautiful crystals, and appeared like choice mineral specimens. Baskets and other devices in covered wire were similarly coated. Sugar was crystallized, beautiful crystals of sulphur, made by slowly evaporating a solution of sulphur in bisulphide of carbon, and another form of sulphur crystals by fusing sulphur in a crucible or gallipot, breaking the crust which first forms on cooling, and then pitching out the liquid. A nest of beautiful crystals remains.

I refer to these crudities in order to suggest that crystal making should be reinstated as a popular scientific recreation. The alums, which are so numerous and so varied in colour, would alone afford material for a little museum; but the amateur availing himself of the achievements of modern chemistry would find the field of recreation to be practically boundless, and the pursuit both elegant and instructive.

Among novelties are the isomorphous double chlorides of alkalis, iron, and of the alkaline earth-metals, such as chromium, aluminium, magnesium, beryllium, &c. Their colours are magnificent, some of them are described by Dr. Neumann as crystallising in splendid octahedrons, resembling large diamonds, and reflecting light with similar brilliancy. They are chemical first cousins to the alums referred to above. From these the ambitious amateur might proceed to artificial gems, some of which, now within the reach of chemical skill, are quite equal to the natural specimens.

Our Much-abused Climate.—We grumble at our climate very unjustly, for though we have not the reliable continuance of bright summer weather, we escape its miseries in the consequent drought, the insect vermin, the venomous reptiles, and other pests that are nourished by it. We also escape the violence that usually accompanies the break up of any long spell of fine hot summer weather. An account recently published in the "Times," of Indian weather, should reconcile us to the occasional frustration of a picnic or garden party, which is about the greatest calamity to which our climate exposes us. At one of "a series" of storms 150 people were killed by hailstones in Moradabad, and many houses were unroofed. At Delhi the hailstorm was a bombardment of ice lumps lasting but two minutes, but with terrible consequences. One hailstone picked up in the hospital garden weighed $1\frac{1}{2}$ lbs., another near the telegraph office 2 lbs. 2000 huts were destroyed at Rayebati, in Lower Bengal, 20 people killed and 200 severely injured. Chudressor was wrecked. The wind lifted large boats out of the river, and one small boat was blown up into a tree. We may be caught in a shower while taking a holiday up the river, but our steam launches are not blown ashore on Eel Pie Island, nor our outriggers up a tree at Henley.

Stature and Climate.—Those who are inclined to attribute a great deal to the effects of climate on the physical development of man, should reflect on the facts pointed by Professor Flower in a recent lecture at the Royal Institution, that the tallest and the shortest people of Europe, the Norwegians and the Lapps live side by side, and that the tallest race in Africa, the Kaffirs, are close neighbours to the diminutive bushmen. The natives of the Andaman Islands and those of many islands of the equatorial region of the Pacific, in which the conditions are similar, are at opposite ends of the scale of height.

The Sight-seer's Headache.—The "Lancet" has done well in taking up this subject, describing it as endemic among the frequenters of picture galleries and museums, and controverting the idea that it is attributable to the atmosphere of such places. I have given some attention to it, and made a few experiments on myself. The conclusions to which I have arrived nearly correspond to those of the writer in the "Lancet." He says that the effort of mind in long continued observation has probably an appreciable, though a secondary influence, but with most persons it is rather fatigue of muscle than of brain. "The maintenance of the upright position during several hours of languid locomotion, the varied and frequent movements of the head, commonly in an upright direction, and the similar and equal restlessness of the eyes, whose focus of vision shifts at every turn as a new object presents itself, form a combined series of forces more powerful in this respect than the sunlight and frequent changes of mental interest and attention by which they are accompanied. The muscular strain implied in these movements is necessarily very considerable." He adds that "the resulting headache has probably much to do with the unusual activity of the cervical extensor and rotator muscles, and of the muscles which move the eyeball."

An experiment that I have made, and repeated several times, specially confirms this theory concerning the neck-moving and eye-moving muscles. I have compared the result of going through galleries and museums with and without a catalogue, and find that the headache commences in a much shorter time with a catalogue than without, in less than half the time. I have spent a whole day in galleries where the pictures are plainly labelled, and have suffered no headache whatever, but always suffer in the course of a few hours when I use a catalogue. I have observed the difference in our mercenary shows—the Royal Academy, &c.—when a friend has appropriated and read out the catalogue. Masterful people like to do this, and being of amiable disposition myself, I submit.

I suspect that the shifting of the focus of vision from catalogue to picture is the chief cause of the fatigue, which appears to have a peculiarly cerebral character. An anatomist will at once understand that

the cerebral nerves are those mostly concerned in these eye movements.

I recommend the boycotting of all picture galleries and other exhibilions where catalogues are sold. Such catalogues are paltry devices for the extortion of an additional fee, and obtaining payment for advertisements therein. Any picture or other object that is worth exhibiting is worth a descriptive label.

SPARROWS.—Among the readers of SCIENCE GOSSIP are many observers of the habits of animals; I therefore note the following as suggestive of further observation and experiment. I reside in an old house with old-fashioned sunblinds outside, and old creeping plants on the walls. In the course of exterior painting, the workmen pulled down a barrow-load of sparrows' nests from the sunblinds and honeysuckle. In the course of a day or two they were all rebuilt in their old places. This was repeated four times at varying intervals, some of them long enough to allow for a fresh supply of eggs, and even the hatching of young birds. At the present time (June 22nd) the fifth series of nests are in their old places. Query: What is the limit of constancy and perseverance of these birds?

I see that the newspapers are reviving the old story (superstition I call it) of sparrows saving fruit trees by eating caterpillars; sparrows have been killed in Kent, and certain fruit-trees have been attacked by caterpillars—ergo, sparrows feed on caterpillars. It would be well if the inventors of these stories would examine the crops of a few sparrows, and learn thereby whether caterpillars or fruit buds and seeds are the most numerous therein. I may add that in my own garden, which is infested with sparrow vermin, a plague of caterpillars also prevails, and the fruit trees are suffering as in Kent.

NOTES ON THE DEVELOPMENT OF THE GNAT (*TIPULA PLUMOSA*), LINN.

By HARRY THOMAS.

DESCRIPTION OF THE LARVA.

[*Continued from p.* 133.]

THE head of the larva is comparatively large, the body tapers gradually, and is divided into twelve segments. The head is provided with four

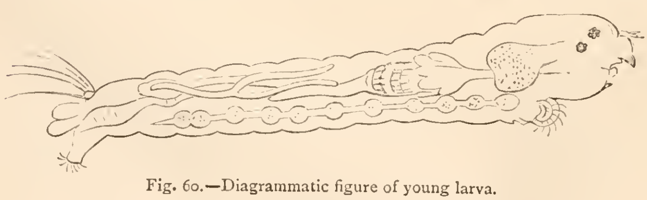

Fig. 60.—Diagrammatic figure of young larva.

compound eyes, two antennæ, and the following mouth parts:—the clypeus appears jointed between the antennæ: it carries on its outer margin a delicate transparent labrum, bearing on its free edge six short filiform processes. Upon either side beneath the clypeus is a well-developed toothed mandible, and below a comb-toothed labium with a broad basal-jointed maxilla upon each side of it. Immediately beneath the clypeus, upon each side, apparently attached to its lower surface, are two chitinous toothed ridges, and lying between them a triangular toothed ridge surrounds the oral aperture.

The segment next the head, carries ventrally a

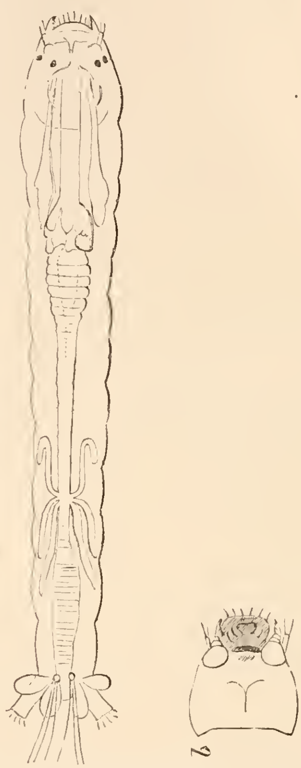

Fig. 61.—(*a*) digestive system; (*b*) lower view of the head.

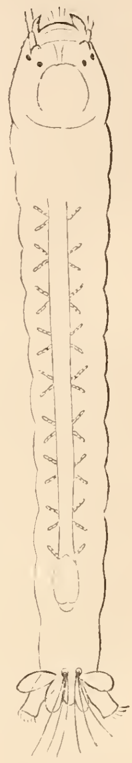

Fig. 62.

process from which two rounded prominences covered thickly with fine hooks, arranged in parallel lines, serve as anterior limbs. These hooked processes can be retracted into their common cushion by muscles attached to their anterior walls. The following ten segments carry no appendages, but the 12th carries the two posterior limbs, very differently formed to the anterior. They are cylindrical and tapering, and carry at their extremities some twelve strong hooks, also retractile, although the limbs themselves are but slightly so. Posteriorly this segment carries four oval processes, and dorsally two small globular bodies, each supporting a few stiff bristles.

The larva at first appears colourless and transparent, and the yolk granules show through the integument a pale brown in colour. When the larva is first hatched, the alimentary canal contains a large proportion of the food yolk. Older larvæ assume a reddish-brown colour, but in both young and old, the internal parts are perceptible (Fig. 60).

The first moult occurs shortly after the liberation of the larva; save in increased size no difference is noticeable afterwards. Through how many moults the larva passes I do not know, but long before it has attained its full size—about ⅜ of an inch—when not quite

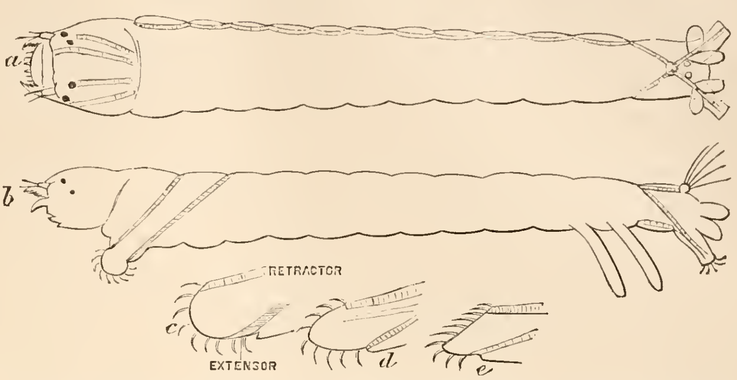

Fig. 65.—(*a*) extensor diagram showing the position of the muscles of the body. Those of the right side only are figured; they occur similarly on the left. (*b*) Diagram showing the position of the muscles of the limbs. (*c*), (*d*), and (*e*) Diagrams illustrating the contraction of the fore-limbs.

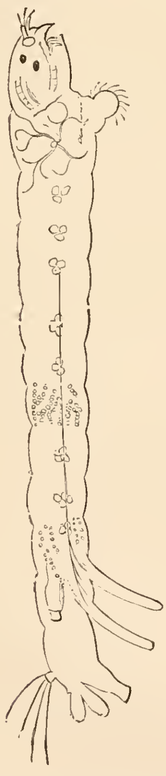

Fig. 63.—The respiratory tissue occurs similarly in the 9th, 8th, 6th, 5th, and 4th segments, although not marked in the figure. The line shows the course of the transparent colourless lines.

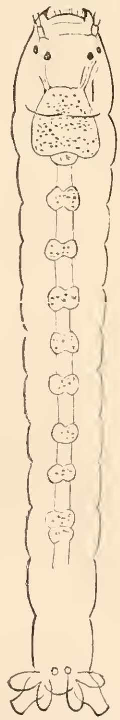

Fig. 64.—Nervous system in very young larva.

a quarter that length, four long processes may be observed from the 11th segment, placed ventral laterally, two anterior and two posterior. It appears to me probable that these processes, as well as the four oval terminal ones, subserve respiration. Such an organ is united to the 11th segment in the common gnat. For the evidence pointing to this conclusion, refer to what is written under the respiratory system; but I may here mention, that the pulsation of the heart ceases each time that the two anterior processes are jerked backward, thus apparently cutting off their communication with the segment.

The Internal Viscera.

The Alimentary Canal.—The œsophagus penetrates the 1st, 2nd, and a portion of the 3rd segment. Upon each side of the 1st and 2nd, lie the salivary glands. In very young specimens I succeeded in tracing the ducts from these glands to the back of the mouth. In the 3rd segment the œsophagus expands into a thick and externally rough-walled gizzard, followed, posteriorly in the 4th by a large proventriculus; this tapers gradually into a long and narrow chylific ventricle which extends to the 9th segment. The ventricle frequently exhibits peristaltic motion. In the middle of the 9th segment six tubes enter the commencement of the short intestine that follows. These are the Malpighian tubes. They are somewhat convoluted; three lie upon each side the 8th, 9th and 10th segments. The intestine is narrower and thinner-walled than the ventricle; it traverses the 9th and 10th; it expands in the 11th, forming a rectum, which ends posteriorly in the anus at the end of the 12th segment (Fig. 61).

The Circulatory System.—A well-developed heart may be observed on the dorsal aspect of the 11th segment, above the rectum; it is composed of a small posterior chamber, the auricle, which opens anteriorly by a valve into a larger and more elongated chamber, the ventricle, and the ventricle in turn opens by a similar valve—preventing a returning current—into the long dorsal aorta which I followed forward into

the 2nd segment. Upon either side of this dorsal aorta processes were present; they occur in pairs, one pair in the anterior and one in the posterior of each segment. They contain sometimes a brown and sometimes a green material, apparently similar to the respiratory tissue which is composed of brown cells in the abdominal segments, but appears green in those of the thorax. (Fig. 62.)

The Respiratory System.—Branching cellular tissue is apparent in the 4th, 5th, 6th, 7th, 8th, 9th, and 10th segments. In older specimens it is present, though less abundant, in the 1st, 2nd and 3rd, and scattered sparely in the 11th. The branching is intricate, but there is no connection between the branches in the separate segments. Upon each side of the segments in which the branches occur, may be noticed three or four small oval impressions clustered together, they occupy the position of stigmata. (Query. Is the integument thinner in these parts?) In my earlier observations I thought I could detect a long transparent vessel upon each side, starting from the neighbourhood of the 11th segment. They appeared shining and colourless through the red

Fig. 66.—The Nymph.

integument, and traversed the region of the body where the respiratory tissue was most abundant. I traced them forward to the 3rd segment. I have since detected portions of transparent vessels that apparently start from, or enter into the processes of the 11th segment and appear intimately connected with the respiratory tissues in the 11th segment. (I am unable to thoroughly satisfy myself concerning these last appearances, as later observation shows the two lateral lines disconnected between each segment.) The walls of the processes are extremely thin.

In very young larvæ, a loose cellular tissue is visible, in the interspaces of the viscera. This structure takes the place of the branching system and gradually developes into it. In old larvæ, branching, vascular tracheæ are apparent in the 1st segment upon each side. In the nymph they appear as external tracheæ. (Fig. 63.)

The Nervous System.—The supra-œsophageal ganglion occurs in the 1st segment; looking down upon the larva, it appears as a bilobed mass. (In very young larvæ, this ganglion is comparatively larger—as are all the other—and lies half within the head and half within the 1st segment; in this stage I was able to trace nerve threads to each of the eyes.) The supra-œsophageal ganglion is united on each side to a smaller ganglion, beneath the gullet, the infra-œsophageal ganglion by a broad commissural cord. There is another small ganglion lying in the 1st segment, immediately following the infra-œsophageal, and they are two other similar ganglia in the 2nd segment, one anterior and one posterior; while similar ganglia occur anteriorly in the 3rd, 5th, 6th, 7th, 8th, 9th, and two in the 10th segment.

In the very young larvæ, there is a ganglion in the 4th, and one only in the 2nd, and each ganglion at that time shows clearly its double origin. The

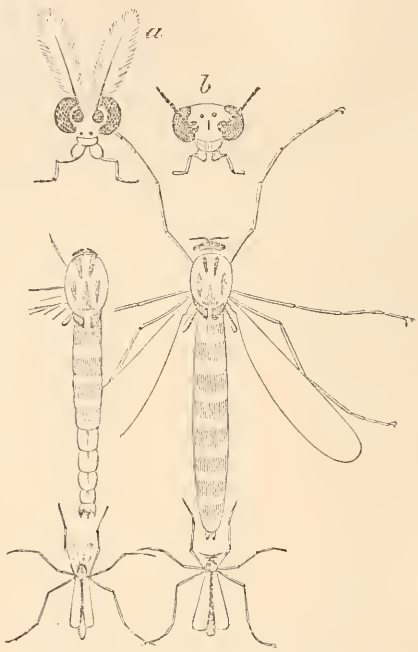

Fig. 67.—(*a*) head of male; (*b*) head of female.

ganglia are united by double commissural cords. (Fig. 64.)

The Muscular System.—The muscles appear as narrow striated bands. Those from the mandibles and other mouth parts are inserted in the posterior walls of the head. The muscles from the head are inserted at the junction between the 1st and 2nd segments, and those of the body appear to be attached and inserted to the anterior of each segment. The fore-limbs are furnished with retractor and extensor muscles; the former are attached to the anterior inner walls of the rounded hook-bearing processes and inserted in the dorsal posterior walls of the 1st segment. By their contraction they draw in the process as you might draw in a tape, the lines of hooks lying forward the while. The extensor muscles are attached to the posterior walls of the limb and inserted in the posterior dorsal

walls of the 2nd segment. By their contraction they expand the process in a contrary direction. The posterior limbs are furnished only with retractor muscles, the circle of hooks they carry being usually expanded. These muscles are inserted in the anterior ventral walls of the 12th segment and to the anterior dorsal walls of the same. The latter cross each other. The terminal bristle-bearing papillæ are each furnished with a muscle inserted in the anterior dorsal wall of the 12th segment. (Fig. 65.)

The Nymph.

For how long a time the larva exists as such I do not know, but it builds for itself small cases of mud in which it dwells attached to the side of the tank, or forms tunnels in the sediment at the bottom. Occasionally they may be seen swimming with a quick often-repeated series of jerks, forming their body into a shape resembling the figure 8. The final larval coat is shed, and the nymph form assumed beneath the water at the bottom of the tank. The larva leaves its tunnel and crawls above the mud previous to this change.

The form of the nymph is very different to that of the larva. The mouth appendages undergo much change —two large compound eyes replace the four smaller ones. The anterior hooked limbs disappear, and to each of the three first segments—now united to form the thorax—a pair of many-jointed limbs is attached, to the 2nd, dorsally, a pair of wings and similarly to the next, a pair of halteres. The head is bent down upon the thorax, and the wings and limbs lie closely against it. The segments of the abdomen suffer less change, the limbs of the 11th and 12th are gone, and in their place the terminal segment supports posteriorly a divided semi-circular appendage bearing respiratory hairs. Respiration is effected by branchiæ, shining silky hairs rising in three tufts from each side the thorax above the head, and others from the terminal segment of the abdomen. I believe that for the greater part of the time the nymph remains beneath the sediment at the bottom of the tank, but before the final change it comes forth, and with much apparent effort swims to the surface. Here it rests for a short time, the dorsal plate of the thorax at the surface, the abdomen bent beneath the water. In a few minutes it bends and straightens itself repeatedly. These movements occur several times with short rests between. In less than a quarter of an hour after it has risen to the surface, the thorax splits down the dorsal plate and the head of the imago projects. I have seen them rise straight up as though they had received a mechanical impetus, they ascend so smoothly from the old nymph skin, taking flight immediately they are free. Usually this coming forth is a more tedious performance, and with their wings yet within the old case, they fall back into the water, where they lie until their struggles have liberated their imprisoned members (Fig. 66).

The Imago.

I have given figures of the male and female *Tipula plumosa*, Linn. The lesser figures are natural size. The male is distinguished from the female, by his antennæ, abundantly feathered, rising from two large, globose, black prominences between the eyes; the terminal segment of his abdomen carries posteriorly, besides the two pulps, common to both sexes, a pair of claspers. The female possesses two fine antennæ which rise from two lesser prominences, similarly situated. They bear but few hairs, hardly perceptible. The terminal segment of her abdomen bears on its sternal surface two palpi, prolonged backwards, they are larger than those possessed by the male (Fig. 67).—*Llandudno.*

A SPIDER'S DEADLY FOE.

I SEND herewith drawings and notes of an ichneumon wasp that preys upon a small spider in Ceylon. I have been unable to identify the insect,

1 Fig. 68. 2 Fig. 69. 3 Fig. 70. 4 Fig. 71.

Fig. 68.—Spider, with parasite *in situ*, magnified.
Fig. 69.—Spider, natural size.
Fig. 70.—Parasite, further magnified, showing eight retractile tubercles upon the back, each of which is crowned with numerous minute fleshy hooks.
Fig. 71.—A single tubercle, highly magnified.

but it is possibly allied to the "pimpla" mentioned by Packard as being parasitic upon a spider in Europe ("Guide to Study of Insects," p. 193). The spider usually attacked is a small black animal with globose abdomen, that spins a loose irregular web on the under-surface of leaves. The ichneumon wasp appears to oviposit upon female spiders only, the males being much smaller and unable to support the wasp grub. The egg is fixed to the abdomen of the spider close to its junction with the cephalothorax. The newly-hatched larva immediately pierces the skin and commences to absorb the juices of its host. The spider continues to feed and remains apparently in good health until the parasite is full grown, when the latter destroys

its victim, leaving nothing but the empty skin. The larva then commences to spin a flask-shaped silken cocoon attached by one end to its support (generally the under-side of a cinchona leaf). It

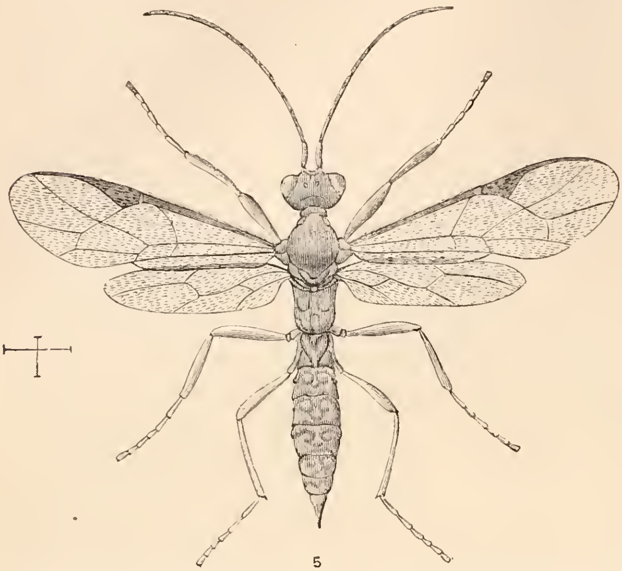

Fig. 72.—Imago, magnified. Colour black; a reddish patch upon the thorax; scutellum and attachment of wings yellowish. Antennæ multiarticulate, basal joint reddish. Legs yellowish, tarsi of third pair and terminal joint of first and second pairs blackish. Wings covered with minute hairs. Segments of abdomen with symmetrical rounded prominences.

builds up the cocoon gradually, completing the walls as it proceeds, forming first a cup-shaped receptacle, which is lengthened by regular additions to the open edge, and finally closed. A specimen under observation completed its work in forty-eight hours. E. Ernest Green.

Punduloya, Ceylon.

ASTRONOMY AND METEOROLOGY.

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

At the meeting of the Royal Astronomical Society, held on May 11th, Mr. E. Crossley gave an account of a large dome he had built and erected at Halifax to protect a reflecting telescope thirty-seven inches in diameter. The dome is thirty-nine feet in diameter, and runs by means of fourteen wheels in a circular iron ring placed on a wall fifteen inches thick. The dome is provided with twenty-three iron ribs. The observer stands in a gallery which moves round with the dome. The dome weighs about fourteen tons. Both the dome, the gallery, and the staircase attached to it, weighing altogether sixteen tons, are moved by a small hydraulic engine placed in a room at the side of the observatory. There are hot-water pipes in the observatory, by means of which it can be warmed in cold weather. Cold water can be run through the pipes previous to observing, so as to cool them very quickly. From personal experience I can say that if the hot-water pipes are used of course only for the purpose of drying the observatory, that although cold water may be run through the tubes, it will not be possible to use the telescope for observing for several hours afterwards. A difference of temperature of one or two degrees will be sufficient to set up tube currents, which in so large an aperture will destroy all definition. The heating contrivance may be beneficial to the telescope, but will be of no other service to the observer.

Mr. Cowper Ranyard describes a contrivance for applying electrical control to the driving clock of an equatorial by making use of the instantaneous current from a pendulum as it passes through a drop of mercury at the bottom of its arc to move a small lever which shifts a little weight from one side to the other of the fulcrum of the clutch which embraces the revolving disc of the governor. The current passes through an insulated revolving wheel. When the clock is fast as compared with the pendulum, the current is sent through a horseshoe magnet on one side of the lever, and when it is slow through a similar magnet on the other side of the lever. This shifts the weight, and increases or decreases the pressure on the revolving governor disc. When the clock is keeping time, the weight is drawn to the central position by a third magnet.

On July 23rd there will be a total eclipse of the moon partially visible at Greenwich. The first contact with the shadow takes place at 3 hrs. 55 m. in the morning. The total phase begins at 4 hrs. 54 m. morn., and ends at 6 hrs. 36 m., the last contact with the shadow will be at 7 hrs. 35 m. The moon sets at 4 hrs. 10 m., about 44 minutes before the total phase commences.

There will be no occultation of any star above the 4th mag. in July.

Mercury will be very near the sun until the middle of the month, afterwards it will be a morning star.

Venus will rise and set with the sun.

Mars will be in Virgo, near to Spica at the beginning of the month.

Jupiter will be in Libra in conjunction with the moon on the 18th at 5 hrs. aft.

Saturn will be an evening star in conjunction with the moon at 8 hrs. aft. on the 10th.

Meteorology.—At the Royal Observatory, Greenwich, the highest reading of the barometer for the week ending 19th of May was 30·20 in. at the

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in July.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	1	5 9M	0 52A	8 35A
	8	4 28M	0 7A	7 46A
	15	3 43M	11 24M	7 5A
	22	3 6M	10 54M	6 42A
	29	2 49M	10 44M	6 39A
Venus ♀	1	3 32M	11 51M	8 10A
	8	3 46M	0 1A	8 16A
	15	4 3M	0 11A	8 19A
	22	4 23M	0 20A	8 17A
	29	4 44M	0 28A	8 12A
Mars ♂	1	1 16A	6 35A	11 54A
	8	1 5A	6 18A	11 31A
	15	0 56A	6 2A	11 8A
	22	0 49A	5 48A	10 47A
	29	0 42A	5 34A	10 26A
Jupiter ♃	1	4 35A	8 59A	1 28M
	8	4 6A	8 30A	0 58M
	15	3 38A	8 2A	0 30M
	22	3 10A	7 34A	0 2M
	29	2 42A	7 6A	11 30A
Saturn ♄	1	6 6M	1 55A	9 44A
	8	5 43M	1 31A	9 19A
	15	5 20M	1 7A	8 54A
	22	4 58M	0 43A	8 28A
	29	4 35M	0 19A	8 3A

beginning of the week, and the lowest 29·37 in. on Wednesday afternoon. The mean temperature of the air was 55·9 deg., and 2·6 deg. above the average. The direction of the wind was variable. Rain fell on two days of the week, to the aggregate amount of 0·32 in. The duration of registered bright sunshine in the week was 39·4 hours, against 40·6 hours at Glynde Place, Lewes.

For the week ending 26th May the lowest reading of the barometer was 29·64 in. at the beginning of the week, and the highest 30·26 in. on Monday evening. The mean temperature of the air was 54·0 deg., and 1·3 deg. below the average. The general direction of the wind was north-easterly. No rain was measured during the week. The duration of registered bright sunshine in the week was 62·3 hours, against 57·1 hours at Glynde Place, Lewes.

For the week ending June 2nd the lowest reading of the barometer was 29·55 in. on Wednesday morning, and the highest 30·07 in. on Friday evening. The mean temperature of the air was 55·8 deg., and 1·3 deg. below the average. The direction of the wind was variable. Rain fell on Wednesday, to the amount of 0·16 inch. The duration of registered bright sunshine in the week was 43·8 hours, against 55·2 hours at Glynde Place, Lewes.

For the week ending June 9th, the highest reading of the barometer was 29·96 in. on Tuesday morning, and the lowest 29·40 in. on Saturday morning. The mean temperature of the air was 58·9 deg., and 0·7 deg. above the average. The general direction of the wind was variable. Rain fell on four days of the week, to the aggregate amount of 0·17 of an inch. The duration of registered bright sunshine in the week was 21·2 hours, against 13·4 hours at Glynde Place, Lewes.

For the week ending June 16th the highest reading of the barometer was 29·94 in. on Sunday evening, and the lowest 29·52 in. on Tuesday afternoon. The mean temperature of the air was 57·1 deg., and 1·9 deg. below the average. The direction of the wind was variable. Rain fell on two days of the week, to the aggregate amount of 0·54 of an inch. The duration of registered bright sunshine in the week was 51·7 hours, against 49·2 hours at Glynde Place, Lewes.

The mean temperature in July is at the Land's End, Hereford, Lincoln and Yarmouth 62°, at Haverford West, Liverpool, Gateshead and Hull it is 61°, at Carlisle, Berwick, Newcastle and Middlesbro' it is 60°, but inland through the greater part of England it is 63°, and in the district about twenty miles round London, it is 64°.

The mean rainfall for July is more equal than that of any other month, being about two inches for the greater part of our island varying only to three inches and occasionally four inches along the West coast.

SCIENCE-GOSSIP.

M. Perrotin has been making some important observations of the channels in Mars, and has described various important modifications that have taken place in these appearances since they were first observed in 1886. The triangular continent, somewhat larger than France (the Libya of Schiaparelli's map), which at that time stretched along both sides of the equator, and which was bounded south and west by a sea, north and east by channels, has disappeared. The place where it stood, as indicated by the reddish-white tint of land, now shows the black, or rather deep blue colour of the seas of Mars. The Lake Mœris, situated on one of the channels, has also vanished, and a new channel, about 20° long and 1° or 1·5° broad, is now visible, running parallel with the equator to the north of the vanished continent. This channel forms a direct continuation of a previously existing double channel, which it now connects with the sea. Another change is the unexpected appearance about the north pole of another passage, which seems to connect two neighbouring seas through the polar ice.

Much interest has lately been taken in an operation in beneficial surgery in which the object was the transplantation of a portion of the nerve of a rabbit, nearly two-and-a-half inches in length, from the

animal to the human being. The patient was Professor von Fleischl, who occupies the chair of physiology in the University of Vienna, and the operator, Dr. Gersung, of Vienna. Sixteen years ago the patient poisoned his right hand, gangrene supervened, followed by neuromata, or nerve tumour. Operations became necessary, and from time to time were carried out, with the result that two fingers lost the sense of touch, owing to the continuity of the nervous system having been broken. On the 4th of March last, a rabbit was killed, and from its still warm body "as long a piece as possible of the sciatic nerve of the animal" was taken out and transplanted into the hand of Professor von Fleischl. The results are said to be favourable.

Mr. J. E. Todd has a paper on the subject of "Directive Coloration in Animals" in the "American Naturalist." He defines directive coloration as that which is in any way useful to a species, by assisting in mutual recognition between individuals, or by indicating one to another their attitude of body, and probable movements. He gives a number of instances.

Another competition in the common field of natural science is announced, "Life-Lore," edited by Mr. W. Mawer (an old and valued contributor to Science-Gossip). The price is sixpence, and the first number was to be issued on June 25th.

Another old friend and contributor to our pages, Mr. Edward Lamplugh, of Hull, is preparing under the title of "Hull and Yorkshire Frescoes," a volume of privately printed poems and sonnets—one for each day of the year, mostly inscribed to Yorkshire men of letters and scientists. One sonnet is inscribed to Science-Gossip.

Dr. Gamalea has been carrying out some experiments on Merino sheep at the experimental station, Odessa, inoculating them protectively against the cattle plague. The results are said to be very hopeful.

Dr. A. B. Griffiths and his wife, of Lincoln, have recently contributed a joint paper, the result of their joint experiments, showing the influence of the various rays of the solar spectrum on the growth of plants. They planted beans and mustard seeds in lively soils, to which iron sulphate was added, and they found that the greatest amount of iron oxide, and probably of albuminoid were stored up in the plants which had been exposed to the yellow-green rays of the spectrum.

French Archæologists have recently discovered in a cave at Mas d'Azil, Ariège, a sub-fossil tooth of horse, carved with the bust of a woman. The pendent breasts and profile of face are said to be carefully delineated. The nose is large and rounded, and the chin retreating. This is the third example found of prehistoric, or Quaternary art.

The Liverpool naturalists made a six days' marine excursion in Whitsun week, between Liverpool and the Isle of Man, and very successfully employed submerged electric lamps to attract swimming objects. These lamps were used both at the bottom and surface of the sea.

M. Jean Luvini has just read a paper before the Paris Academy on the "Origin of Aurora Borealis." This phenomenon he regards as analogous to the discharge of electricity in thunderstorms, the only difference consisting in their different degrees of intensity. Both are attributed to the friction of particles of water and ice, and occasionally of other minute bodies, drawn by the aerial currents into the higher atmospheric regions and disseminated over the terrestrial atmosphere some hundred miles thick. The northern lights are most frequent about the pole, where the air abounds most in icy particles and where the field of terrestrial magnetism is most intense.

MICROSCOPY.

Magnification in Photo-micrographs.—A friend of mine, Mr. Walter Osmond, who photographs a good deal with the microscope, inquires how he should fix the magnification of his objects as shown in his pictures? Using a ¼-inch objective and an ocular which together give 300 diameters, with the eye-glass at 10 inches from the paper, he gets a field as nearly as possible 6 inches in diameter. Employing the same eye-piece and objective in his camera, he gets a disc in his photos of 2·9 inches. He fixes the magnification in the photo at 145 diameters, by the following simple rule-of-three sum:—6 : 2·9 : : 300 : 145. Similarly, with a 2-inch objective and a powerful ocular, which together give 55 diameters at the standard height of 10 inches, he fixes the magnification of his photos at 26½ thus:—6 : 2·9 : : 55 : 26·583. Is this correct? You will observe I distinguish in this note between the "magnifying power" of an objective and "magnification," implying by the latter term mere enlargement, and confining the former "magnifying power" to that particular degree of enlargement which is obtained when an image is projected by any kind of microscopic camera, on a plane horizontal surface parallel to the body of the microscope, and distant exactly 10 inches from the centre of the eye-glass of the ocular. I would only add, that such rough measurement as can be made by opening both eyes, and comparing an object with a rule laid at the stage, serves to show that Mr. Osmond's method is correct.—*W. J. Simmons, Calcutta.*

The Combined Use of Celloidin and Paraffin.—Kultschizky states that the use of both celloidin and paraffin in imbedding microscopical preparations has certain advantages over that of either

material alone. The individual parts of delicate objects preserved their proper relations; the preparation remains dry, and the process of making sections does not require the use of alcohol, and sections can be made as thin as when paraffin only is used. The method is as follows:—The alcoholic preparation is allowed to lie for a few hours in a mixture of equal volumes of alcohol and ether; it is then placed for twenty-four hours in a solution of celloidin, the strength of which is immaterial. It is now placed in ordinary oil of origanum, subsequently in a mixture of paraffin and oil of origanum, which should not be over 104° Fahr. in temperature, and finally in melted paraffin. The length of time that it should remain in the oil of origanum, in the solution of paraffin, and in the melted paraffin, depends on the character of the object, and must be ascertained by trial.

NEW SLIDES.—From Mr. F. Enock (Woking), we have received a splendidly-mounted specimen of the large jumping spider (*Salticus tardigradus*) mounted without pressure. The object retains the natural form of the creature, and the eyes are as brilliant as noble opals. It is mounted as an opaque object. Mr. Ernest Hinton (12 Vorley Road, Upper Holloway) has kindly forwarded us a most interesting and cleverly cut and mounted preparation, shewing the unisexual flowers from inside the common fig. It plainly illustrates the remarkable mode of reproduction of this plant. The flowers are packed all over the inner surface, and are merely divided from each other by soft, colourless bracts. The specimen is intended to be examined by the paraboloid.

ZOOLOGY.

THE BOAR-FISH (*Capros aper*, Cuv.; *Lens aper*, Linn.).—Yesterday morning, April 19th, five living specimens of this rare and beautiful fish were sent me from Babbicombe, where they had been just caught in a mackerel-net. They had been unfortunately conveyed in so small a quantity of water, that by the time they reached me they were nearly exhausted. Yet on being immediately put into a large marine aquarium, two of them revived. These have passed the night well, and are vigorous this morning; their brilliant hues, and sprightly movements, rendering them ornamental and attractive. The specimens were all exactly alike. Total length 5 inches, vertical depth (from points of first dorsal to points of ventral) $3\frac{1}{2}$ inches; thickness, just behind head, $\frac{3}{4}$ inch:—colour pale scarlet, fading to pearly white on belly, rich vermilion on back, whence undefined bands run vertically down each side; the stouter fin-rays are tipped with scarlet. Yarrell (Br. Fish. vol. i. 190) has given a very good figure of the species, which he considers one of much rarity, insomuch that the first British capture of it recorded (in October, 1825) was considered an occurrence worthy of being communicated to the Zoological Society. The present is, however, not the only occasion on which I have known it taken in Babbicombe Bay; where it is known by the name of the Fan Dory, in apparent distinction from its near ally, the John Dory (*il janitore*). In captivity, as I have said, this charming fish is of graceful and pleasing manners. Ever retaining its vertical position, it swims incessantly about, gliding to and fro into every part of the tank, usually a few inches below the surface, ever protruding and retracting its telescopic snout, its strong spinous fins erected, and its immense liquid eyes greatly enhancing its beauty.—*P. H. Gosse, F.R.S., Sandhurst, St. Mary church, Torquay.*

PHYSA ELLIPTICA.—On the 12th of October, 1887, I was at Powderhorn, in Gunnison, co. Colorado, and close to White Earth Creek I found a very small and shallow pool crowded with a species of Physa new to the Colorado fauna, which Mr. H. A. Pilsbry has kindly determined for me as *P. elliptica*, Lea. This species has something of the outline of *P. fontinalis*, but the mantle is not spread over the shell. The specimens belonged to a var. *decollata*, having the spire eroded and truncate, which may have been due to overcrowding, and the fact that the only food they had consisted of dark green globular algæ, about the same size as the physæ. Small limnæa are now very abundant in the road-side ditches about West Cliff, Custer co., which I cannot distinguish from European *Limnæa truncatula*, although in America they would be referred to *L. humilis*, Say.—*T. D. A. Cockerell, West Cliff, Colorado, May 10th*, 1888.

BOOK-WORMS.—In the interest of a number of book-lovers out here, I avail myself of the pages of your popular and widely-read journal to bring the facts stated below to the notice of the publishing firms at home. Recent publications are attacked by larvæ, which in many cases bore their way right through a book. They usually start from the inner edge, or thereabouts, of the covers; in other cases they select other points of attack, while in several instances the bore begins mysteriously in the very heart of a volume. I have found larvæ and pupæ, and frequently little brown beetles (in one case four or five ant-pupæ) in these borings, but I think the beetle larva is the chief delinquent. I have not found ova. The new "serials," indeed all new books, biographies, science primers and manuals, and the like, are special favourites with these pests. Mites sometimes are to be found, and lepismæ, which are said to feed on mites, but not to injure the books themselves. I now "kyanize" all new books with a weak solution of corrosive sublimate dissolved in spirits of wine, and applied freely to the inner surfaces of the covers, about the binding, &c.,

but of course not to the outside anywhere. The remedy, however, is not a pleasant one when applied in my method; it would be better if the paste employed in binding were itself so poisoned. As the larvæ do not attack unbound papers, stitched or wired magazines, &c., it seems fairly safe to infer that it is the paste which proves attractive, and that it should be poisoned with some drug which will retain its toxical properties in sufficient strength to destroy the young larvæ as soon as they touch it. I have had books attacked in the course of one week. The point to be remembered is that it is the newly-bound volumes which suffer; old books escape.—*W. J. Simmons, Calcutta.*

Development of the Gnat.—Errata, page 133. The following figures should be transposed:—Fig. 55 should be 56; Fig. 56 should be 55.

Pallas's Sand Grouse (*Syrrhaptes paradoxus*). Six specimens of this rare and remarkable bird were killed from a large flock in the neighbourhood of Fyvie on the 26th of May; they had been seen for some time previous in small and in large flocks. Being natives of the far east, they have probably been driven here by stress of weather, and are now seeking breeding-ground. It would be very interesting to know if they should remain to breed, being unknown in the British Isles before 1859.—*W. Sym, Fyvie.*

Irruption of Pallas's Sand-Grouse.—Mr. W. Eagle Clarke, F.L.S., the senior assistant in the Museum of Science and Art, Edinburgh, writes as follows to the "Naturalist":—"Once more, after an interval of a quarter of a century, Europe and the British Isles are the scene of an irruption of Pallas's sand-grouse (*Syrrhaptes paradoxus*, Pall.), large flocks of which, leaving their home in the Steppes of Central Asia, have been making their way westward during the past month or two. On the 21st of April they appeared in various localities in Poland; on the 27th, they reached Saxony; on the 5th of May they were seen in the island of Rügen, and on the 7th in Holstein. They reached England about ten days later. On the 17th of May a specimen was brought in the flesh to me at the Leeds Museum, which was said to have been shot in Dewsbury Road, Leeds. On the 18th Mr. Philip W. Lawton saw five at Shurn, and the same day (as Mr. Lawton informs me) a man at Patrington saw a party of about a score. Since then Mr. Lawton has had numerous examples brought to him for preserving. On the 19th, Mr. Donkin saw a party of twenty in a field adjoining the Ardsley reservoir, near Leeds. On the 20th large flocks, as reported in the newspapers, were seen in Oxfordshire, and at Hoddesdon, in Hertfordshire; and others, the date of which I have not seen noted, were reported from Clifton, Nottinghamshire. On the 24th, Mr. Thos. Bunher wrote me that one had been captured alive near Goole, and on the same date Mr. Frederick Boyes, of Beverley, wrote me that about fifty or sixty had been seen at Flamborough, and that Mr. Harper, of Scarborough, had called to tell him that he had seen about thirty at Spurn. In a note in "The Field" of May 26th, Mr. Boyes remarked that these birds appeared on the east coast of Yorkshire on the anniversary of the day on which they were first observed a quarter of a century ago, and that a flock seen on the 20th, at an East Yorkshire locality, the name of which he does not give, contained at least a dozen birds. In the same note he states further, that a friend saw about thirty at Spurn on the 25th of the month. On the 24th, one was telegraphed on the Boroughbridge Rcad, near Norton-le-Clay, and eight others are said to have been seen in the neighbourhood. As it is desirable that an ample record should be kept of this most noteworthy and interesting ornithological event, I hope all readers who have it in their power will communicate to this journal full details and particulars to such occurrences in Northumberland, Durham, Yorkshire, Lincoln shire, Nottinghamshire (including the details of the Clifton instance), Derbyshire, Cheshire, Lancashire, Westmoreland, Cumberland, and the Isle of Man, as may come within their observation."

BOTANY.

A May Ramble at Prinsted.—Unpromising localities sometimes reward the explorer in unexpected ways and delight him with the sight of plants little anticipated. Prinsted Common, at the western extremity of Sussex, appears to have been long ago reclaimed from the sea, which still occasionally makes inroads upon it. Flat and of small dimensions, there is little to interest in its immediate scenery, excepting the distant S. Downs and the intermediate spires of Chichester Cathedral and that of the ancient church of Bosham; but the tract itself, an expanse of sward, surrounded by banks, contains a very varied flora. Among the Cerastiums largely predominates *C. tetrandrum* with its fine white blossoms intermingled with abundance of *Mœnchia erecta*. The turf is decked with *Trifolium subterraneum*, *T. minus*, and *T. filiforme;* and occasionally patches of *Trigonella ornithopodioides* are to be seen. One of the banks presented at intervals quantities of the pale pinkish petals of *Cochlearia Danica*, which in hue differs so much from its congeners as to be easily recognisable, not to speak of its deltoid leaves. Near it amongst the grass also appeared an unexpected little plant *Myosurus minimus*, of various size, from half an inch (in full flower) to six or seven inches in height. Most botanical records mention it as growing in fields or gravel pits, but here it seems to delight in a different situation, and it appears to be sporadic, for a year

ago, not an example could be seen. *Ranunculus parviflorus* occurred in plenty. *Myosotis collina* studded the ground with its blue blossoms, and not far off *M. versicolor* also grew with *Aira præcox*. *Plantago coronopus* was one of the most abundant plants on the common, which is fringed on one side by the curious trailing *Torilis nodosa*, while later on in the season *Bupleurum tenuissimum* is also to be found here. Passing towards the shore *Lepidium campestre* was conspicuous, and a small pool was completely mantled with white by the flowers of *Ranunculus Baudotii*. An hour's ramble was thus well repaid, on a lovely spring afternoon.—*F. H. Arnold.*

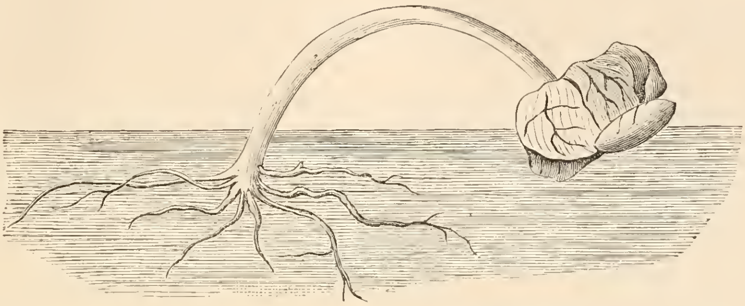

Fig. 73.—Melon-seedling found in a water-melon when first cut open.—*Sholapur, India*, 1888.

LYCHNIS DIOICA.—I have just noticed a singular instance of change of colour, in certain specimens of *Lychnis dioica*, which bore pure white flowers last summer; have their petals this summer of a pale red colour, and do not appear to be quite as large in size as the white ones. The plant grows in a well-sheltered spot not far from the sea coast.—*Geo. Rees.*

NATURAL GRAFTING.—I saw rather a peculiar thing the other day—a large branch had broken off a box-tree, and in falling, had stuck in a fork of the tree, and there the branch is growing. In falling, the branch must have bruised through the bark and the sap run from the tree into the branch. It has evidently been there some years, as the branch is quite grown over in the fork.—*E. C. Pope, South Yalgogrin, N. S. Wales.*

UNUSUAL CASE OF GERMINATION.—I am sending you a sketch of a melon seedling (Fig. 73). I found it growing on the pulp inside a very large water-melon. It seemed quite happy in the dark; there was room for it to stretch, as these melons are rather hollow. The two leaves were a bright, tender green. One or two other seeds were just beginning to sprout. The sketch is life-size.—*Amy Hensley, Sholapur, India.*

PRESERVING THE COLOURS OF PLANTS.—Have any of the readers of SCIENCE-GOSSIP tried a process for preserving the colours of plants for the Herbarium recommended in the 'Annals of Botany,' and consisting of sulphurous acid, three parts; methylated spirit, one part? If so, I should be glad to hear what their experiences have been. The experiences I had were most disastrous. The recipe said, for plants with fleshy leaves twelve to eighteen hours will be sufficient. So I put some *Orchis mascula* in the solution, and in twelve hours took them out; the effect was peculiar, the leaves were flabby, and of a dirty yellowish-green colour, and the flowers had a little colour and shape left, but I defy any botanist to determine what species they belong to. Thinking I might have left them in too long, I tried some *Cochlearia Anglica*, and left it in forty minutes; on taking out, the leaves were flabby, and of the same dirty yellow-green colour as those of the orchis. I then tried some flowers of *Scilla nutans*, and in ten minutes they had lost every vestige of colour. Is this preserving the colours of plants? If so, I would rather stick to the old style of drying. There is also a process with salicylic acid and methylated spirit. Do any of your readers know anything of it?—*A. E. Lomax.*

USTILAGO RECEPTACULORUM.—Could any reader of SCIENCE-GOSSIP favour me with a fresh specimen of the goat's-beard smut during the present summer?—*Charles B. Plowright*, 7 *King Street, King's Lynn.*

GEOLOGY, &c.

THE GLACIATION OF THE ISLE OF MAN.—In SCIENCE-GOSSIP for April last (p. 73) is an article entitled "In the Isle of Man," by Dr. P. Q. Keegan, in which several remarkable theories and statements as to matters geological are set forth. The author makes merry at the expense of geologists because, forsooth, they ascribe certain boulder-deposits to glacial action, and says, "the idea of these outlying, heterogeneous masses of rocks being gradually pushed up from below by some lateral or other pressure, seems never to have tickled their heads." It always appears to me unwise to suppose oneself superior to scientific authorities without first carefully examining the evidence and the existing theories.

That geologists are well acquainted with the fact, that materials may be "pushed up from below [*i.e. from the sea-bottom*] by some lateral or other pressure," is shown by a note in Dr. A. Geikie's Text Book, 2nd edition, p. 897, in which we read, "Mere fragments of marine shells in a glacial deposit need not prove submergence under the sea; for they may have been pushed up from the sea-floor by moving ice, as in the case of the shelly till of the west of Scotland, Caithness, Holderness, and Cromer." Professor H. Carvill Lewis, speaking of what he terms the Irish Sea Glacier, says, "South of Manchester it contains flints and shell-fragments, brought by the glacier from the sea-bottom over which it passed." British Association Report, 1887, p. 692. To suppose, however, that most deposits called glacial are merely scrapings from the sea-bottom is to ignore the abundant evidence afforded by those boulders, the origin of which can be traced. Dr. Keegan continues, "there is little or no evidence of local glaciers, or indeed of ice chiselling of any kind." On this point I can speak from personal knowledge, as I formed one of a party of the British Association which visited the island in September 1887. At Scarlet Point, to south of Castletown, a considerable, slightly sloping surface of carboniferous limestone has been exposed by removal of the surface-soil, in a large quarry close to the shore. On the limestone are unmistakable glacial striæ, the direction of which two observations gave as E. 35° N. and E. 37½° N. (corrected 21° for magnetic declination). I have a piece of the striated limestone. At Port St. Mary, on the outer side of the shore end of the new concrete pier, even more distinct glacial striæ were observed, on the carboniferous limestone, which slopes towards the sea. The average direction of the striæ is E. 33° N. This is within 2° to 4½° of being the same as that observed at Scarlet Point. In both cases several square yards of rock were covered with striæ. From the beds immediately overlying the limestone at Port St. Mary and from within 3 or 4 feet horizontally and vertically of the striæ, I have obtained a rounded and well-scratched boulder, 4¾ inches long, and weighing 1 lb. 13 oz. These facts are, I think, sufficient to show that the Isle of Man has suffered some glaciation. The beautifully rounded and undulating outlines of the hills suggest the same thing, although Mr. H. B. Woodward says (Geol. of England and Wales, 2nd edition, p. 79), "In consequence of its want of durability, the mountains of this [Skiddaw] slate, as John Phillips remarked, have smoother contours, more uniform slopes, and a more verdant surface than those of the Borrowdale Series." Not all the clay-slate of the Isle of Man, at any rate, appears to be wanting in durability, judging by the excellent state of preservation of the Runic crosses at Kirk Braddan, which are supposed to date from between A.D. 1170 and 1230. The ice at Scarlet Point and Port St. Mary no doubt travelled from a north-easterly, in a south-westerly direction, as Cumming, in his geologically useful, though old, work called "The Isle of Man" (Van Voorst, 1848) mentions some transported blocks or boulders, the parent rock of which was known, as having travelled in that direction.—*Bernard Hobson, B.Sc.* (*Vict.*) *Manchester, May 10th.*

NOTES AND QUERIES.

British Achatinæ.—In Catlow's "Popular Conchology," page 178, it is stated with regard to the Achatinæ:—"Two small species, *Achatina acicula* and *Achatina octona*, are found in England, among the roots of trees, etc." Does any reader know anything of *Achatina octona?*—*Francis B. Long, Burnley.*

Night-Flowering Convolvulus.—I have before me "A Tour round my Garden," translated from the French of Alphonse Karr by the Rev. J. G. Wood, 1856. On page 65 I read "The Convolvulus does not expand its flowers till the night is pretty far advanced," and again, page 143, "Convolvulus, whole flowers close and fade as soon as they are touched by the sun." What species of Convolvulus blossoms by night, as is here stated?—*Julie Hodgson.*

Remarkable Frost Phenomenon.—About the 12th January there occurred here a frost phenomenon, a brief notice of which may be interesting to the readers of Science-Gossip. During the week commencing on the 8th, the weather was remarkably mild and spring-like—so mild indeed that my wife and I went down to the coast and spent some delightful days in geological exploration—gathering, amongst other good finds, an ammonite new to the Yorkshire Lias. Towards the end of the week the sun became obscured by a dense fog, though the weather still continued mild. I found on returning home that the fog had been prevalent there also. Some days later, passing over the high ground which separates this parish from the neighbouring parish of Bilsdale, I observed branches of trees broken off on all sides, some of them quite six inches in diameter at the point of breakage. In some cases the tops of spruce firs were broken off, and some smaller trees were broken short off in the stem. Finding a man mending the road I obtained from him the cause of all this destruction, which had certainly puzzled me, as there had been hardly a breath of wind of late. I found that during the time of the fog the trees on the lower grounds had been dripping with moisture. On the higher ground the temperature had fallen below freezing-point, and the moisture had continuously frozen on the branches. Near the summit the amount of moisture had been augmented by a breeze drifting it out of Bilsdale. Pointing to quite a small branch, which had fallen with many others upon the road, so as to make it impassable for carriages, the man told me that, when the ice was upon it, he had only just been able to lift it over the wall.—*John Hawell, Ingleby Greenhow Vicarage, Northallerton.*

Varnishing Photo Gelatine Dry Plates.—I should be glad to know if white hard spirit varnish would be suitable for varnishing photographic gelatine dry plates. I have a large quantity of the

spirit varnish and have bought repeatedly negative varnish at three times the price, and should be pleased to know if the varnish I name would do. Surely there is nothing in the spirit varnish that could be unsuitable, and nothing in the so-called negative varnish that is absent from the best white hard spirit varnish. That which I have is the best to be obtained, made by the most reputed varnish manufacturers. —*H. Fisher.*

SACCHARINE.—Referring to the article on Saccharine for May, can Mr. Wicks say why Saccharine is precribed for patients suffering from Diabetes when sugar is considered harmful?—*Rev. H. Whittaker, Peterborough.*

YEW-TREES, THEIR AGE, &c.—You were good enough to admit into your January number a letter of mine inviting discussion on yew-trees, and the mode of ascertaining their age. In your February number three letters appear in reply. I wish, first of all, to thank the writers. In the first letter, A. G. Tansley calls my attention to "the two finest yews in the Malvern country, in Cradley churchyard," and adds that "the largest is 26 feet in circumference," quoting a "Botany of Malvern" as his authority. I have since measured the Cradley yews, and found one 17 feet 7 inches, and the other 17 feet 9 inches in circumference, making allowance in the one case for a portion of trunk which had evidently disappeared. J. Saunders, Luton, the writer of the second letter, is good enough to promise the measurement of some Bedfordshire yews. Both these writers, however, seem to object to the measurement of the diameter instead of the radius. Allow me to explain that I used the word "line" in its arithmetical sense, as meaning $\frac{1}{12}$th of an inch, and without any reference whatever to the concentric rings, and I adopted the diameter as simply a convenient mode of expressing the size. I have to thank W. E. Windus for calling attention to the Crowhurst (Sussex) tree, and for the promise of the photograph, a copy of which I have since received. Your correspondent F. C. D. B. in the March number, besides giving particulars of the yew at Ankerwyke House, also evidently thinks the size may be conveniently expressed by the length of the diameter. And this is, of course, the same thing as measuring the circumference and taking one-third of it as representing the diameter, only in taking the circumference it must always be the smallest circumference, whether it is three feet or more or less from the ground being a matter of no moment. As an authority for taking a line of diameter to represent a yew, I refer to Mons. A. P. de Candolle's remarks on the subject in Dr. Pye Smith's "Geology and Scripture," as follows:—"Of all European trees, the yew appears to me to be that which attains the greatest age. . . . If for very old yews we take the mean of one line a year, it is probable that we are below the truth" (it is necessary, however, here to add that he takes the line to be $\frac{1}{10}$th of an inch), "and that in reckoning the number of their years of age as equal to that of their lines of diameter, we make them younger than they are." He continues: "Now I have become acquainted with the measurement of four celebrated yews in England. That of Fountain Abbey, ... of which we have historical notices in 1133, was, according to Pennant, in 1770, 1214 lines in diameter, which will give above 1200 years of age. That in the churchyard of Crowhurst, Surrey, is stated by Evelyn, in 1660, to be 1287 lines of diameter. . . . That of Fotheringhall, in Scotland, had in 1770 a diameter of 2588 lines, and its age is consequently twenty-five to twenty-six centuries. That in the churchyard of Braburn, Kent, had in 1660 a diameter of 2880 lines; if, then, it be still in existence, it must have reached 3000 years." The Braburn yew, I may add, is no longer in existence. In 1660, when Evelyn measured it, he found it 58 feet in circumference. Balfour, in his "Botany and Religion," adopts Mons. de Candolle's list of "Remarkable Trees, the ages of which have been ascertained," and gives 2880 years as the greatest of the yew. In an article in "Eng. Cyc." on the age of trees, there is a "Table of the Rate of Increase in Diameter of certain Exogenous Trees expressed in Lines," and amongst them a yew seventy-one years old, whose diameter was 69½ lines.—*P. J.*

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.

J. A. H. and others.—The author of "Sagacity and Morality of Plants" was slightly in error in referring (page 31) to Mr. Grant Allen's *work* on "The Shapes of Leaves." The subject was treated upon by Mr. Allen in "Nature" (1883) under this title, but we believe the papers have not been republished.

J. T. BALCOMB.—Thanks for your specimens. We will bear the matter well in mind.

M. E. POPE.—Many thanks for your kindly interest in the old "SCIENCE-GOSSIP." We wish all our subscribers were as good proselytisers!

C. WILSON (Southport).—The plant is *Claytonia perfoliata*—a Canadian species, and an excellent salad plant, containing oxalic acid in its leaves.

G. GRIERSON.—Write to Dr. M. C. Cooke, 146 Junction Road, Upper Holloway, London, N.W.

GEO. CAMPBELL.—Apply to the editor of the Geologists' Association, Professor Boulger, 18 Ladbroke Grove, London, W., for the paper on "Agates."

E. BROWNE and others.—Mr. Brunetti's address is 129 Grosvenor Park, Camberwell, S.E.

J. B.—We expect you refer to the late Dr. Lankester's "Uses of Animals to Man" for the paper on Tannin. If so, enquire of Messrs. W. H. Allen, Waterloo Place. You will find good papers on Tannin in the last edition of Professor Johnson's "Chemistry of Common Life," edited by Professor Church.

W. GYNGELL.—Address, the "American Naturalist," 501 Chestnut Street, Philadelphia, for exchange.

W. L. K.—Apply to Mr. King, Sea Horse House, Portland Road, London.

EXCHANGES.

MARINE shells, rubbings of memorial brasses, and curios; what offers? Will send list of either if wished.—Archibald Hy. McBean, S. Denys, Southampton.

WANTED, eggs, in clutches, of rare British birds; also cuckoo's eggs, with full data. Offered, a good exchange in insects, eggs, or shells.—W. K. Mann, Clifton, Bristol.

RARE Scotch and Irish mosses and hepatics offered in exchange for others. Special desiderata, 26, 27, 99, 106, 109, 121, 135, 147, 154, 156, 166, 169, 173, 183, 187.—W. B. Waterfall, Thirlmere, Redland Green, Bristol.

MOSSES and hepatics offered in exchange for slides of same. —W. B. Waterfall, Redland Green, Bristol.

WHAT offers in unmounted micro-material for first-class slides of the following: arranged foraminifera (50 varieties); sections of species of echinoderms (20 varieties); sections of bone and teeth (in Canada balsam), showing the lacunæ and canaliculi;

whole insects mounted without pressure; and choice stained and injected preparations?—A. J. Doherty, 63 Burlington Street, Manchester.

WANTED, all or any of the following shells:—*Trochus millegranus, T. Agathensis, T. alabastrum, Mangelia* (pleurotoma) *Teres, M. cancellata, M. reticulatum, M. leufroyi, M. linearis, M. scabia, M. guinniana, M. nana, M. striolata, M. coarctatus, Anomia striata, Nucula sulcata, Arca tetragona, Tellina balaustina, Lutraria oblonga, Saxicava Norvegica, Pholas crispata, Thracia distorta, T. pubescens, T. villosiuscula, Fusus Islandicus, F. Turtoni, F. Berniciensis* and *Isocardia Cor.* Will give any other rare British shells, fossils, minerals, polished Devonian corals, or sections of corals, ready for mounting for the micro.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, Devon.

WANTED, vols. 14–19 of "Entomologist's Monthly Magazine," or any of them, in numbers or otherwise; also numbers from January 1886 to present time, inclusive. Will give in exchange numbers of "Popular Science Review," microscopic slides, or cash.—C. F. George, Kirton-in-Lindsay.

I SHOULD be glad if any conchologist would oblige me with any of the following, to complete a collection for a school museum:—*B. Leachii, V. cristata, Pl. lineatus, nitidus, Ph. hypnorum, fontinalis, Sph. ovale, P. roseum. nitidum, L. glutinosa, involuta, A. lacustris, S. oblonga, H. lamellata, cartusiana, concinna, pygmæa, C. Rolphii, vertigo* (any species).—Chas. A. Whatmore, Much Marcle, Herefordshire.

DRAGONFLIES wanted from all parts of the British Isles, fresh and unset preferred. Offered, *A. adippe, G. rhamni, A. selene, A. euphrosyne, L. sinapis,* and many others.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, anything photographic, in exchange for quantity of micro-slides and unmounted objects.—J. Wain Wilshaw, 455 Shoreham Street, Sheffield.

UNBOUND volumes of SCIENCE-GOSSIP, "Design and Work," "Amateur Work," and "English Mechanic," in exchange for good tripod stand, ½-plate lens, or photographic literature.—J. Wain Wilshaw, 455 Shoreham Street, Sheffield.

FOR exchange:—"Tabular View of Orders and Families of Mollusca," by Dr. Woodward (500 figures), in book form, published at 4*s.*; "Objects of Microscope," by Lane Clark (coloured plates), published at 3*s.* 6*d.*; "Magician's Own Book, with 999 Tricks," published at 3*s.* 6*d.*; "Common Outdoor Birds," by Stannard," published at 1*s.* 6*d.* The above are all in good condition, nearly new. Natural history books, or good shells and fossils wanted in exchange; books preferred.—Ernest O. Meyers, Richmond House, Hounslow, W.

To Egg Collectors.—Have several "Sooty Ferns" and other rare eggs to exchange for side-blown, one-hole, authentic specimens, clutches preferred.—Commander Young, R.N., Rodwell, Weymouth.

DUPLICATES.—*Z. excavatus.* Wanted, *S. ovale, P. nitidum, P. roseum, L. glutinosa, S. virescens, S. Pfeifferi, S. oblonga, H. lamellata, H. revelata, H. furca, H. obvoluta, B. montanus, A. lineata.*—A. Hartley, 5 Albert Street, Springfield, Idle.

ENGRAVINGS of varieties of unios and anodons, for *Anodonta anatina* or *Unio pictorum.*—Geo. Roberts, Lofthouse, Wakefield.

L. C., 8th edition. Wanted—74, 1136, 1188, 1250, 1666*b*. Will give in exchange any of the following:—588, 620, 1558, 1597, 1627, 1628, 1692.—W. W. Reeves, 32 Geneva Road, Brixton, S.W.

OFFERED, "Leisure Time Studies" (Wilson); "Nature's Bye-paths" (Taylor); "English Folk-Lore" (Dyer). Wanted, "Geology of England and Wales" (H. B. Woodward), 2nd edition.—J. Smith, Monkredding, Kilwinning.

OFFERED, good quantity of the fine diatomaceous deposit from Poplein, U.S.A., and other localities, in exchange for similar and other good micro material and slides.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

WANTED, animal hairs for micro mounting; good exchange in micro and lantern slides, &c. Lists exchanged.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

WILL exchange nests and well-blown eggs of nightingale, blackcap, willow wren, shrike, meadow pipit, landrail, grebe, &c., for nests and eggs of reed, grasshopper, Dartford and garden warblers lesser whitethroat, cirl and common buntings.—Harry F. Medley, Romsey, Hampshire.

Two dozen histological slides, in case, for any suitable offer; also earlier edition of Cassell's "Book of Birds," parts 1–28. Wanted, British coleoptera and hymenoptera.—J. B. Mayor, 5 Queen's Terrace, Longsight, Manchester.

SPECIMENS of *Unio margaritifer* wanted from any district in Ireland, especially Co. Tyrone. Good exchange in same species from its only known Lancashire station, or other land and freshwater shells.—R. Standen, Swinton, Manchester.

WANTED, British or foreign lepidoptera; British land and freshwater shells offered in exchange.—T. A. Lofthouse, 67 Grange Road, Middlesbro'.

WANTED, good works on British lepidoptera and conchology. "Flowers of the Sky" (Proctor); "Naturalist's World" for 1886, unbound; "Civil Engineers' and Architects' Journal," vols. 7 and 10, and odd numbers of SCIENCE-GOSSIP offered in exchange.—T. A. Lofthouse, 67 Grange Road, Middlesbro'.

FINE specimens of gold sulphuret, malachite, carnelian, bloodstone, and other minerals, offered for good foreign marine shells; will send sketches, to size, on receipt of lists.—W. J. Jones, jun., 27 Mayton Street, Holloway, London, N.

WANTED, Geikie's "Text-Book of Geology;" Rutley's "Study of Rocks;" Ganot's "Physics;" Dana's "Mineralogy," 1887, and Greenwood's "Metallurgy." Good exchange given. J. D., 146 Ecclesall Road, Sheffield.

WANTED, student's microscope fitted with polariscope, &c. Offered, mahogany case of hydrometers, fossils, minerals, books, &c.—J. D., 146 Ecclesall Road, Sheffield.

SOME exquisitely beautiful species of exotic lepidoptera, in good condition and well set. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

WANTED, pupæ of British lepidoptera; will make a return in imagos.—Joseph Anderson, jun., Alre Villa, Chichester.

BRITISH and foreign shells and minerals, collection of British mosses (in book), a remora (sucking fish), and a rhinoceros horn, in exchange for a tricycle, safety bicycle, or fancy pigeons.—F. Marriott, 69 Duke Street, Old Trafford, Manchester.

WANTED, Nos. 74 and 75 of SCIENCE-GOSSIP (1871) to make up set; will give in exchange two good micro-slides for each or any part.—J. J. Andrews, 2 Belgravia, Belfast.

I HAVE *H. pomatia* and *Cyclostoma elegans*, also the egg of an Egyptian goose; what offers? Should like marine shells, birds' eggs, or curios.—Archibald Hy. McBean, S. Denys, Southampton.

WANTED, telescope, microscope, or drawing instruments in exchange for miscellaneous or educational books.—G. Newton, 7 Basuto Road, Fulham, London.

SPECIMENS from about fifty or sixty species and varieties of British land and freshwater shells, named and localised, for a similar number of land and freshwater shells of other countries.—T. Rogers, 27 Oldham Road, Manchester.

WANTED, a good $\frac{1}{10}$-inch or $\frac{1}{12}$-inch objective; will give first-class diatom slides in exchange.—T. B. Bessell, 8 Elmgrove Road, Bristol.

WANTED, a German-English Dictionary; will give good exchange in diatom slides.—T. B. Bessell, 8 Elmgrove Road, Bristol.

WANTED, freshwater algæ, mounted or unmounted; will give in exchange other good microscopic slides or other unmounted objects.—J. Collins, 23 Roland Road, Lozells, Birmingham.

To Egg Collectors.—I will exchange splendid specimen of Pallas' sand-grouse egg, for golden eagle or other rare eggs.—Chas. Fidler, New Square, Chesterfield.

OFFERED, "Journal of Postal Microscopical Society" for 1882 and 1883, and "Journal of Microscopy and Natural Science," 1884–7 (24 parts). Wanted, "Geologist" for 1859–60.—J. Smith, Monkredding, Kilwinning.

WANTED, British birds' eggs in clutches; also cuckoos. Can offer various natural history specimens.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WANTED, micro object cases (not racked) to hold 144 slides; also glass-capped boxes. Named and localised fossils, from various formations, offered in exchange.—P. Thompson, 19 Guerin Street, Bow, London, E.

P. glaber, P. dilatatus, Valvata piscinalis, H. arbustorum, and others, in exchange for British or foreign land and freshwater or marine shells.—W. Dean, 50 Canning Street, Stoneyholme, Burnley, Lancashire.

P. glaber in exchange for other land and freshwater shells.—Thomas Ingham, 3 Railway Street, Darwen Terrace, Blackpool.

BOOKS, ETC., RECEIVED.

"Story of the Nations: Assyria" (London: T. Fisher Unwin).—"Nature's Fairy Land," by H. W. G. Worsley-Benison (London: Elliot Stock).—"Trans. Leeds Geological Association."—"Illustrated Manual of British Birds," Part III.—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of the Trenton Nat. Hist. Soc.," January.—"Eleventh Annual Report of Hackney Microscopical Soc."—"Trans. Chichester and West Sussex Nat. Hist. and Microscopical Soc."—"Journal of Microscopy and Nat. Science."—"Ottawa Naturalist."—"Scientific News."—"Wesley Naturalist," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: C. W.—J. T. P.—J. D. Y.—F. L.—E. E. G.—A. J. D.—W. K. M.—Rev. H. W.—W. B. W.—W. A. C.—E. L.—Dr. G. C.—B. A.—F. H. A.—S. J.—M. A.—Dr. J. R.—P. J.—F. H. A.—S. D.—Rev. C. J. S. B.—W. J. S.—T. D. A. C.—W. J. S.—E. B.—R. D. A.—C. F. G.—C. R.—W. G.—W. J. S.—Dr. H. W. W. B.—H. M.—R. W.—B. H.—J. S. G.—H. J. G.—G. A. M.—S. D.—J. J. A.—J. A. H.—G. A. G.—C. W.—W. J.—H. W. B.—R. C. R. J.—S. H., &c., &c.

BRUCE!

By J. E. TAYLOR.

"And hopes that in yon equal sky,
His faithful dog shall bear him company."

WE have been friends and companions for nearly seven years. We so thoroughly understood each other that we rarely quarrelled — for quarrels are always the result of misunderstanding. I am not quite a believer in the Indian doctrine of metempsychosis, but there is something in it. "All creatures meet in man," said good George Herbert. You find one man "foxy" in cunning, another "weasely" in suspicion, a third "hoggish" in feeding or "fishy" in drinking (or both). The best thing you can say of a man is that he is as "faithful as a dog." So, you see, the dog bears the palm from the man!

My dog had nothing human about him, and was therefore an ideal dog. He was as well known about the town as myself. Even the butcher-boys seldom teased him. You would hear the lads calling, "Bruce, Bruce," to him in any part of Ipswich, whenever we wandered in search of quaint undescribed archæological "bits." The little dogs often followed him, and sometimes barked at him, but Bruce took no more notice of them than he did of the musical chimes of St. Matthew's Church. He was a Prince among dogs. He never stooped to anything mean, or low, or cowardly. He was unpunctual sometimes in his returns from calling on his friends; but nobody would have known it if his own conscience had not forced him to assume that depressed appearance we call "hang-dog." Nor did he come up to Professor Huxley's definition of a dog as an "arrant cad"—one which only barked at people who were ragged, and reserved his attentions for the well-clad. Bruce did prefer well-dressed and good-mannered people—who does not? That was all. As he used to lie outside my garden-gate, with his fore-feet stretched out, and his magnificent, black, square head between his paws, there was not a working man going or returning from dinner who did not stop to pat him, and say, "Bruce, good Bruce!" And Bruce responded by a gentle switch of his great feathery tail, which sent the flies spinning. The babies tottered up to him, and pulled his long silken ears, and gave him biscuits. Even the cats passed him by without setting up their backs, for they had found out that Bruce was harmless.

Bruce was my literary friend. He has lain hours, days, months at my feet whilst I have been writing. He has listened, with one twitching ear, whilst I have read aloud to myself some sentence I had written which I thought unusually good—and afterwards dropped it, wondering what it was all about, and what good in the world it was to a dog! How well he knew me! I had my moments of depression, of anxiety, of low-spiritedness—frequently brought on from assiduous over-work and over-worry. Bruce knew! Often has he silently thrust his great, cold, black nose into my hand at such times. I knew what he meant—"Cheer up, master; 'Heart beneath and God o'erhead'!"

Bruce came to me in disgrace. He was a fine black, smooth-haired, retriever, and his crime was that he would not retrieve. Perhaps he was like myself—he didn't care to have anything to do with that form of pleasure which is connected with suffering and death. I fancy some keeper must have peppered him in disgust at his unexpected and non-sportive

qualities, for he never heard a gun fired without cutting home as fast as he could. Nevertheless, the instincts of his breed were there. I have a stupid habit of lingering by wayside stone-heaps, and poking among the stones, if haply I may find some flint implement or fossils. Likewise a gravel, clay, or sand-pit has a similar attraction for me that a public-house has for other men—I cannot pass one. Bruce soon found all these weaknesses out. On a country ramble, if he were ahead, Bruce never passed a stone-heap or a gravel-pit—he stood there till I came up, and said as plainly as an intelligent dog could, "Master, are you going in here this morning?" I have seen that look hundreds of times, and said to him, "Not this morning, Bruce;" whereupon he wagged his huge tail at the compliment that he was understood, and proceeded on his own canine investigations. I used to say to my friends, "Bruce knows as much about geology as most men," whereupon some of the easily-surprised ones said "Indeed!" and the others, who were conscious that they knew no more of geology than my dog did, laughed at my weak joke.

Bruce was nearly as old as my youngest child. They were almost babies together. As soon as my baby-daughter could toddle, Bruce was her companion and playfellow. She rode astride his big black back, and Bruce would then put out his great red-flannel strip of a tongue on one side, as if he were proud that a mere dog could be so useful. The children played "Little Red Riding Hood" with him. He was the "Wolf," and was put to bed with a white night-cap on his splendid black head—only he wouldn't go to sleep, or pretend to. He preferred to see what was going on, and every now and then to put in a word or two, and interrupt the dialogue in the form of a sharp bark.

The last time Bruce appeared in public (for he frequently made his way surreptitiously on to my platform) was a few weeks ago, when Mr. Leighton Bailey gave his lecture on Australia, and I proposed a vote of thanks. The people called out "platform," and on to the platform I went. There was a large audience, and they cheered me. Then, just as I was speaking, there was another cheer. It was for Bruce, who had followed me, and now stood confronting the audience I was addressing, greeting their cheers with a few short but vigorous barks. The more they cheered the more he barked at them, until, at a word from me, he coiled himself up, and the subsequent proceedings interested him no more.

Such was my canine friend of seven years' standing —faithful, obedient, sympathetic. We found him last Friday morning—dead. Evidently he had been poisoned, and I don't envy the brute who unfortunately poisoned him. The children cried and sobbed. I felt that another friend had joined those on the Silent Shore. But I am thankful I ever had the friendship of Bruce. I am a better man for it; and God has not sent even a dog into the world without a purpose!

REMARKS ON BRITISH BOTANY, AND ON PLANT COLLECTING.

By A. Bennett, F.L.S.

It is seven years since the author of "The Cybele Britannica," Mr. H. C. Watson, died. Since that time how many of our local botanists have made themselves acquainted with his compendium of the above work, issued in 1870? I fear far too few; and yet it is the most interesting of all his works on our flora, whether we consider its range as showing the distribution of our flora in Britain, or outside of our country, the numerous valuable comments on sub-species and varieties, or the attempt to eliminate the doubtful records from the real. His later work, "Topographical Botany," goes into more detail, and shows the county distribution of every species (then known) of our flora, and in its second edition is available to all (the first being only privately printed). Now, my reason for writing these notes is to call more attention to these works of Mr. Watson, and to beg of collecting botanists to try and gather better and fuller specimens than many now do. It is really quite unfair to those who are asked to name specimens to send wretched fragments (such as are often sent!) on which a man must either stake his reputation, or give possible offence from a supposed want of courtesy by refusing to name such. And the more critical the genus, the greater need for full specimens. An experience of a few years with the various exchange clubs compels me to say, that generally we are behind Continental botanists in the usefulness and scope of our gathered specimens.

And again, our botanists generally fail to tell us in what sort of a place the plant grows; the parish is given, but usually not a hint whether it is on a heath, roadside, common, &c. Not that all are so lax; there are now several of our botanists who are most careful to indicate the height, situation, &c., on their labels; these are hence valuable, especially if from a province where the range was not known, or only imperfectly known to Mr. Watson. I had through my hands last year some hundreds of voucher-records from Scotland, and the difference in the way they were recorded was remarkable; some thought the year and county was sufficient, others put on their labels all that one could desire or expect. Much of this, I fear, comes from the rage to collect rarities; of course, most of us want to gather some "good things," as we call them; but I shall never forget the words that good and estimable botanist, the Rev. W. W. Newbould, said to me when I was first introduced to him: "Don't hunt for rarities, but gather all, and examine all, and you will find more rare things than rushing from one place to another after them," and my experience is, he was perfectly right.

With many of us our time is limited and opportunities few; but I could point to several botanists

with little spare time who have done some good work; in fact, more so than many with plenty of leisure.

Some have urged, "We cannot send our notes anywhere;" but this is wrong, with the numerous natural history journals, and in nearly every county there is now some scientific society (a long list of these societies was published in this journal a few years ago), and now many are linked together in "Unions;" for example, "The East of Scotland Natural History Union," "The Yorkshire Naturalists' Union," and the Midland. We want such for the South of England; or, if the ground is thought too wide, the south-east and south-west. These societies are of great benefit, as bringing under more experienced eyes the work of the several ones affiliated to them, and the chances of errors being disseminated becomes much less.

We cannot grumble at the want of good books in our flora, with such books as Babington's "Manual," Hooker's "Student's Flora," and Bentham's "Handbook;" it is probable that at no time have such accurate and full Floras been extant. Yet, even now, my own impression is that we have still a great deal more to learn of the life-histories of our plants than is usually thought.

Of course, the botanist who really wants to know all he can about our plants will not be contented with these Floras even, but will seek more extended information in such works as Symes's "English Botany" (3rd ed.), now to be found in most good libraries where books are lent out.

If he can read French, I would advise him to get the last edition of Lloyd's "Flore de l'ouest de la France;" if Latin, Koch's "Synopsis of the German and Swiss Floras." Unfortunately, I know of no book so accessible as these for Scandinavian plants. Fries' are now getting old, and the admirable "Handbook" of Hartman is written in Swedish.

But our botanist must not make the mistake (as Professor Babington remarks in his "Manual") of thinking that he has found a new British plant because it seems to fit the description of a Continental species; but a reference to Professor Babington or Mr. J. G. Baker would soon decide what he had gathered, to both of whom we owe so much of the great advance in British botany since 1843.

Another thing we much want in British botany is, that more botanists would take up the study of particular orders and genera, and work at them with a view to correlating our forms with the W. European ones. It may not be out of place here to name some of those who will be glad of help in the respective genera (it is needless here to name Professor Babington for rubi, or Mr. Baker for the roses), such as Mr. Hanbury for Hieracia (who is engaged on an illustrated monograph of the British species), Mr. F. Townsend for Erythræa and Euphrasia, Mr. Beeby for Spargania and Junci, the Messrs. Groves for Characeæ, and I myself should be glad of help in Potamogeton (as would my good friend Mr. Fryer of Chatteris), Carex or Salix. But we still want many others taken up, such as the Batrachian Ranunculi, Potentilla, Mentha, Rumex, Atriplex, &c., and some of the genera of grasses as Agrostis, Poa, or Festuca.

It is only fair to say, that where specimens are asked to be returned, stamps should be sent to cover postage by parcel post, as this is now an inexpensive way of sending specimens. A large number may be sent in one parcel, if care is taken to use thin paper; it matters little how thin the paper is, so long as the outside covers are stout and tightly bound by string.

If these crude notes, written as they are as a sort of general reply to many queries, should stimulate to the study more, and the rarity hunting less among our flora, I shall be content.

NOTES ON THE FLORA OF THE SOUTH DOWNS.

MR. LAMB has already given an interesting paper on the Flora of the North Downs, and perhaps a few notes on the South Downs around Lewes may be useful as a further illustration of the flora of the chalk formation.

As might be expected, many of the species are identical, but there are some few exceptions and additions.

The Chalk Hills of East Sussex are remarkably free from wood, except some few plantations chiefly on the northern slopes; they thus differ very much from the Downs of West Sussex and of Kent.

It may be convenient to divide the plants into three divisions—those of the open down; those of the cultivated tracts, which tracts have lately been much on the increase, and those of the woods.

Taking the open down first, the most noticeable plants are *Poterium sanguisorba*, *Hippocrepis comosa*, *Ononis arvensis*, *Phyteuma orbiculare*, *Scabiosa columbaria*, *Anthyllis vulneraria*, and its variety *Dillenii*, *Spiræa filipendula*, *Pimpinella saxifraga*, *Asperula cynanchica*, *Polygala vulgaris* and *calcarea*, *Linum catharticum*, *Thymus serpyllum*, *Cnicus acaulis*, *Carlina vulgaris*, *Gentiana amarella* and *campestris*, *Orchis ustulata*, *Ophrys apifera*, *Gymnadenia conopsea*, *Thesium humifusum*, *Senecio campestris*, *Cerastium semidecandrum*, *Orchis pyramidalis*, *mascula* and *morio*, *Habenaria viridis*, *Ophrys aranifera*, and *Herminium monorchis*, *Helianthemum vulgare*, and *Viola flavicornis*—a dwarf form of *Viola hirta* also occurs, which does not seem to be quite the same as the *Viola calcarea* of Cambridgeshire. The bulk of the turf consists of *Festuca ovina*, and *Bromus erectus*, with here and there an admixture of *Kœleria cristata*, *Briza media*, *Avena flavescens*, and on the

northern slopes in places the very conspicuous *Brachypodium pinnatum.*

In the rougher places among the abundant furze *Ulex Europæus* (*U. nanus* does not occur), and on broken declivities and edges of cultivated ground, grow *Rosa micrantha*, *Rosa rubiginosa* rarely, *Rosa spinosissima* and *Rosa sepium*, the last named very local, *Carduus nutans* and *crispus*, *Centaurea scabiosa*, *Inula conyza*, *Centaurea calcitrapa*, *C. solstitialis* (locally), *Echium vulgare* (especially near the sea), *Onobrychis sativa*, *Hyoscyamus niger*, *Cynoglossum officinale*, *Verbena officinalis*, *Galeopsis tetrahit*, *Chlora perfoliata*, the very local *Seseli libanotis*, *Hypericum hirsutum*, *Conium maculatum*, *Senecio erucifolius*, *Lactuca muralis*, *Campanula trachelium*, *Marrubium vulgare*, etc., *Juniperus communis*, so common in West Sussex, is extremely rare here, and only grows to the height of a few inches.

The cultivated tracts produce, besides the usual plants of such districts, some interesting species, among which may be mentioned *Papaver argemone* and *hybridum*, *Lithospermum arvense*, *Galium tricorne*, *Linaria elatine*, *spuria*, and *minor*.

The wooded parts are chiefly composed of beech and ash, oak only occasionally occurs. The undergrowth contains *Viburnum lantana*, and more rarely *Rhamnus catharticus; Pyrus aria* is rare. These woods are rich in orchids. The following species grow rather commonly —*Listera ovata*, *Cephalanthera grandiflora*, *Orchis maculata*, *Ophrys muscifera*, *Habenaria chlorantha*, and *Neottia Nidus-avis*, while *Herminium monorchis*, *Cephalanthera ensifolia*, and *Aceras anthropophora* are rare. *Viola hirta* is common, and *Viola permixta*, resembling in some respects both *hirta* and *odorata*, is frequently found. *Geranium pratense* and *columbinum* occur in a few restricted localities, as well as *Daphne mezereum*. About seventeen species of *Orchidaceæ* are recorded from the chalk of East Sussex.

Of the species mentioned by Mr. Lamb, the following I have never seen on the chalk of East Sussex, viz. *Helleborus fœtidus*, *Papaver somniferum*, *Malva moschata* (common in the Weald), *Atropa belladonna*, *Verbascum Lychnitis*, *Ajuga chamæpitys*, *Buxus sempervirens*, *Orchis militaris* and *fusca*, and *Epipactis latifolia* (a wealden plant), while *Iris fœtidissima* is very rare, and *Taxus baccata* invariably planted. *Ophrys arachnites*, *Orchis hircina* and *O. simia*, which have been met with on the chalk in Kent, are quite unknown in Sussex, and we miss entirely *Astragalus hypoglottis*, *Thalictrum saxatile*, and *Anemone pulsatilla*, which are characteristic of the chalk of Cambridgeshire.

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ON VARIOUS ROTIFERS (*ASPLANCHNA MYRMELEO*).

By C. ROUSSELET.

I HAD the good fortune a few days ago to find this fine and very rare Rotiferon, which has not yet been properly figured nor described, and only recorded once in England.

Dr. Hudson, in a footnote on page 123, vol. i. of his recent work on the Rotifera, says: "His (Ehrenberg's) *Notommata myrmeleo* is unknown in England, but Leydig has made it clear that in this instance Ehrenberg has made a mistake, and that the Rotiferon has not got the cloaca which Ehrenberg describes. It is therefore an Asplanchna with a foot; one much resembling that of *Notops clavulatus*. Its jaws, ovary, vascular system and eye resemble those of *A. Brightwellii*."

Fig. 74.—*Asplanchna myrmeleo*. Female × 75.

And in Addenda to the same work, Mr. P. H. Gosse remarks of *Asplanchna myrmeleo*: This interesting species is no longer an alien. Mr. Hood has lately sent me from Dundee, living and healthy examples. They seemed to possess no contractile vesicles."

No figure is given, and Pritchard's illustration of this species, which he evidently copied from some

continental work, probably Ehrenberg's, has only a very distant resemblance to the original.

It gives me therefore much pleasure to submit a sketch from life of this handsome Rotiferon, with a short description of its structure.

In size, structure of ciliary wreath and general appearance *Asplanchna myrmeleo* greatly resembles *A. Brightwellii*, only that it has a small two-toed foot on the ventral side of the bag-like body, which is its most characteristic peculiarity. The ciliary wreath is not continuous, but interrupted, forming eight strongly ciliated patches round the edge of the corona; within are seen two tubular sense-organs, furnished with a tuft of setæ. There is one single eye seated on the dorsal side of the brain mass, from the brain two fine nervous threads run downwards to the rocket-shaped dorsal antennæ.

The jaws are sharply pointed pincers and not serrated. The long delicate œsophagus leads to a large thick-walled stomach, which is a blind sack held in position by some fine muscular threads attached to the wall of the body below. There is certainly no intestine or cloaca, and the animal is therefore a true Asplanchna.

Several of them had swallowed small water-fleas (*Chydorus sphæricus*), the empty shells of which I have seen ejected by the mouth. One of the water-fleas was of considerable size, and the stomach was well stretched over it, which enabled me to note that the wall appears to consist of a single layer of large and thick, brownish cells, densely ciliated on the inner surface, and each having a clear shining nucleus.

Immediately above the stomach, and attached to the œsophagus, are two large gastric glands, each of which is double.

The ovary is a very large horseshoe-shaped structure, very broad and flat at the ends; attached to the middle of the ovary is always a maturing ovum, of varying size, but I have never seen a fully formed young, as is so often the case with the other Asplanchnæ, although I have seen many individuals and observed them for several days. It appears therefore probable, that the eggs are expelled and left to develop outside.

From the ovary a very thin-walled oviduct leads to an opening just above the foot.

The muscular system is normal; four broad bands arise from the head and are attached low down to the sides of the body wall, and a number of very fine threads keep the various organs in position; five or six fine muscular threads encircle the body transversely, and a broad band of loosely connected, elongated muscular cells surround the neck region.

The contractile vesicle is very large and of usual structure, situated immediately behind the foot; two sets of lateral canals arise from it and end in the region of the head; they are convoluted in two places, and branched, or double, part of the way; vibratile tags are numerous, but appear to exist only where the canals are double, and then only on one of them.

The foot is very small in proportion to the size of the animal, and situated in the ventral angle of the body, but sometimes its position is much higher up; it is retractile and has two small toes, by means of which it can, and does, attach itself occasionally to foreign objects. The foot has four retractor muscles, two attached to the head, and two fixed laterally to the sides of the body; in the interior of the foot is seen a large oval gland. Every time the head is drawn in, the foot is driven out with a rush, by the pressure of the fluid within the body cavity.

Size of female is $\frac{1}{30}$ in. to $\frac{1}{24}$ in., found in a pond at Staines. The male has not yet been seen.

It is strange that this large and conspicuous Rotifer, which can easily be seen with the naked eye, has so long escaped detection in England, where a whole army of microscopists explore almost every pond in the country during the summer months. Perhaps also it has been seen and not recognised, from want of a published figure and description.

I much regret that Messrs. Hudson and Gosse have not made their fine work complete by including therein "all" the known species, whether found in England or elsewhere. The distribution of these minute creatures is so very wide, that every species is almost sure to be found in England sooner or later, and a "complete" monograph of the class would very greatly assist in finding and identifying them. Perhaps this may ultimately be remedied by the issue of a supplementary part.

July 3rd, 1888.

NATURAL HISTORY NOTES IN NORWAY.

By Willoughby Gardner.

On the 4th of July last year, I sailed in the good ship "St. Sunniva," from Leith, for a ten days' holiday in Norway; the weather, unlike that in England, had been very wild and wet over the greater part of Scandinavia for two or three weeks, but the meteorological reports foreshadowed a rising barometer in the north, and we started with most brilliant anticipation, which was very fully realised. Although I formed one of a party of friends for the most part without particular scientific instincts, I looked forward to in indulging in a little natural history, if possible, by the way, and therefore went provided with blotting paper, for pressed plants, and sundry small boxes, and butterfly net, for insects. It turned out, however, that with as much sight-seeing as we could possibly do every day amidst the glorious scenery of the western fjords, there was little spare time for collecting of any kind, and these notes are therefore unfortunately but very meagre; such as they are though, I trust they may be of interest.

Norway is a country with a very remarkable

climate from its northern latitude (Trondhjem is on the same parallel as Iceland, and Bergen even is rather farther north than St. Petersburg), one would expect it to be very severe and inclement, but, owing to the Gulf Stream flowing directly against its coasts, its western shores enjoy a remarkably mild and agreeable temperature; at Skudesnæs the mean register of January is 34°, and of July 54°, Fahrenheit, —*i.e.* only a difference of 20°; the rainfall in these districts is however very excessive, reaching to as much as 90 in. per annum at Florö, against an average of under 30 in. in England.

Towards the interior, however, the climate shows much greater extremes; the valleys some sixty to one hundred miles from the coast are sometimes almost unbearably hot in summer, and in winter they are very cold—the salt water of the fjords forming a solid highway for the sleighs of the inhabitants for many months together.

I mention these facts to show what a variety in Fauna and Flora may be expected in S.W. Norway, much more than one would imagine in a district so close to the Arctic Circle.

Then again, although there is probably less sunshine in Norway in the course of a year, than with us, there is very much more of it in summer; south of Trondhjem even, there is veritably no darkness whatever for many weeks in June and July, which has a marked effect upon the vegetation; although trees and plants of perennial growth are much more stunted than with us, especially inland, where they experience a long vigorous winter, all flowers and foliage are very much more luxuriant than in this country, owing to the continued daylight and long hours of sunshine developing them to an unusual degree. The progress of vegetation is so extraordinarily rapid that in the north of Norway barley will often grow 2½ inches in twenty-four hours, and it is planted and harvested in the space of ten weeks!

Our first landing was at Bergen, where we spent our time very agreeably amidst the accustomed sights of the place. Here I will only mention that we visited a most admirable museum, where I should recommend all travellers to spend as much time as possible; this hint may prove useful if it is wet out of doors, as may frequently be the case in a town where it is said to rain on at least three hundred days in the year! Besides a truly magnificent collection of Norse antiquities, extending from the earliest stone ages to the historic period, the museum contains a most interesting and complete series of Norwegian fish and marine animals, from the huge whale skeletons in the main hall, downwards; we noticed fine seals, walruses, sword and sunfish, and also bears, polar and brown, reindeer, and all other Scandinavian animals, even to the little lemming of the mountains; some of the birds were remarkably well set up,—the snowy owls and a nest of young ones of another species, being particularly conspicuous.

From Bergen we took train in the evening to Vossevangen, and on the following day drove through the most varied and wonderful scenery to Gudvangen on the Nœrofjord. It was truly a glorious morning, bright sun, and weather all that could be desired, so I got out my butterfly net, hoping to have occasion to use it during the journey. For the first hour and a half, I saw nothing on the wing, but about 10.30 A.M. insect life began to stir, and I pulled up the pony and jumped out of my stolkjærre precipitately (to the huge amazement of the small post-boy hanging on behind) to give chase to what proved to be neither more nor less than a "common blue" (*L. Icarus*). Nothing daunted, however, I kept my "weather eye" well open as we drove along, and during the course of the next few miles my captures consisted of *Lycæna Agon*, more *Icarus*, and *C. Pamphylus*; a little later, on a bank of brilliant flowers beside a river, I gave chase to a butterfly which appeared very like our British *Pararge Megæra* on the under side, when settled, but which proved to be a variety of the widely-spread continental *P. Mæra*. My specimen does not agree exactly with any types I have seen in collections or figures, being distinctly darker in colour, and with the fulvous bands on the fore-wing larger and more brilliant.

The flora here was of mountain character for the most part, but very luxuriant in growth; I never in my life saw such magnificent beds, one might call them, of oak and beech fern; parsley fern, too, appeared in glorious bunches on the higher grounds, the fronds being remarkably fine; *Asplenium Trichomanes* grew everywhere in the rocks, but seemed barely so thriving as it often is in Wales. Every now and then we stopped to regale ourselves on delicious wild strawberries and whinberries by the wayside, and I also gathered a few black crowberries (*Empetrum nigrum*). Many ordinary English wild flowers grew in the greatest profusion in sheltered situations, and near the streams, hair-bells, ragged robin, and heartsease were especially noticeable for their very large and brilliant blossoms—specimens being in many instances almost half as large again as with us. The common sundew or fly-catcher (*Drosera rotundifolia*) I also noticed in damp places, and the leaves were fully an inch across—perhaps a merciful provision of Providence in a land of midges and other insect pests! *En passant*, I will say that we were fortunate in escaping without serious attack from the mosquitos, which are such a nuisance in some districts, more particularly towards Sweden; we found a species of horse-fly very annoying, however, the blood-thirsty creatures were like the man-eating tigers of India; when they once tasted good English blood, they gave up henceforth all idea of subsisting on the life fluid of ordinary Norwegian pony!

About mid-day, near Vinje, we came to some very

good collecting ground for Lepidoptera, and saw numbers flying about in some open glades and hay fields full of wild flowers, at an altitude of nearly 1000 ft., by the side of a river. While one of our party was engaged in taking some photographs, I had a good look round for half an hour; numerous Fritillaries were on the wing here, but the only specimen I took proved to be *A. Aglaia*—of the usual English type; *Lycæna Alexis* and *Icarus* and *C. Pamphylus* again abounded. I saw, though I did not capture, another *P. Mæra*; my most noteworthy "take," however, was a specimen of *Polyommatus Hippothoe*; this is the true Hippothoe of Linnæus and Esper, or the Chryseis of Hübner, not the variety of Dispar called by the name; it is interesting to the English collector as having been formerly taken in this country at Ashdown Forest in Sussex, and also in Epping Forest. My capture here was unfortunately rather a ragged specimen, but this is of frequent occurrence in these wild mountainous districts, where insects soon get knocked about, owing to the often boisterous weather.

Further on, as we neared the Stalheimsklev, we came into a district of wild moorland with forests of fir, some 1200 ft. above the level of the sea. Here I pulled up once or twice to pursue a pale-looking Geometer which flitted away every now and then across the road, and which turned out to be our familiar *Melanippe montanata*; in some places it was very abundant, but it seemed to be the sole representative of its family in these parts, where one would at least have expected to turn up something more unique. Presently, however, a quick dark flying insect of Erebia-like appearance caused me to dismount and give chase hurriedly, and a lucky "catch," in very awkward and rough ground, revealed a most interesting insect in *Erebia Ligea*; the specimen taken is of the northern form, with smaller spots and fulvous bands on the forewing than the type; this again was, to me, a most interesting capture, being the first time I had ever taken the species, though I have carefully scrutinized numbers of specimens of its near ally, Blandina, from the slopes of Goat Fell, in our Scotch Isle of Arran, in the hopes of discovering the true Ligea, which was formerly reported to have been captured there by two different collectors; though these insects are very similar upon the upper surface, there is no mistaking the white anti-marginal splash on the under side of the hind wing of Ligea.

Passing through these fir-woods, numbers of a small skip-jack beetle flew about the road, which proved to be none other than the pretty little *Corymbetes cupreus* of our Welsh mountains; this was the only Coleopterous insect that I noticed in any profusion; but driving somewhat rapidly through a country is not a very satisfactory way of collecting, and I am sure that the whole of this district would well repay a thorough investigation.

Of bird life we saw but little that was remarkable during the journey; the familiar field-fare was recognizable at once, flying mostly in pairs; it breeds here, of course, only going south to England for the winter. Magpies chattered here and there and everywhere among the woods: these birds are great favourites with the peasants in the country districts; they become very tame in the long severe winter, hopping unmolested in and out of the houses, where they are fed and encouraged as visitors of happy omen, much as robins are with us; and woe be to the stranger who should attempt to do them any harm.

The common crow of Norway is what we call the "hooded crow;" it was to be seen everywhere about the country, while rooks and carrion crows were conspicuous by their absence. A pretty little wagtail, the "grey-headed" (*Motacilla neglecta*) I think, flitted about by the side of every stream.

We did not have the luck to come across an eagle or anything else specially noteworthy.

Reaching at length, after five hours' driving, the far-famed Stalheimsklev, the magnificent scenery of the gorge of the profound and sombre Nœrodal, with its stupendous precipices of over 3000 ft. high on either side, its two huge water-falls, and other attractions, quite took away one's attention from any of the smaller objects of interest in nature; leaving the zigzag road and climbing down beside the Selvefos, almost enveloped in the vaporous spray which drifted about in huge clouds around us, I noticed, however, a most beautiful and rare Saxifrage growing among the rocks, probably *Saxifraga splendens*, which had a tall and most graceful pyramid of snowy white star-like flowers, some twelve to eighteen inches high. I managed to secure a root, which, unfortunately, I could only keep alive for a day or two, and was charmed with its most delightful fragrance, given off chiefly during the evening.

The huge and awful precipices towering some 3000 ft. above our heads as we drove along the bottom of the Nœrodal, are chiefly composed of a light grey felspathic gneiss; primary rocks are the order of the day in Norway—granite, gneiss, quartz, mica, felspars—all to be seen, now, much as when first deposited, and seldom covered by any more recent formation; truly, for the geologist, this is a country of rare attractions, presenting a series of rocks of most hoar antiquity, and with perhaps few strata later than the Silurian.

During this day's journey we had our first glimpse of Norwegian hay-making, a somewhat novel process; the coarse rank grass, mixed half and half with thistles and various other miscellaneous plants, which is dignified by the name of hay, is a most valuable commodity in this country, where all communication from place to place is carried on by means of ponies in carrioles and stolkjærres; the

crop therefore, such as it is, gets no ordinary care and attention, and the patient plodding Scandinavian peasantry, knowing that it would stand a poor chance of drying in this uncertain climate if left upon the ground, take the trouble to hang it up handful by handful on rows of hurdles brought out for the occasion into the hayfields. The idea is a good one, as the grass dries very rapidly in this way; it might possibly be worth the consideration of the now much straitened British farmer, who also usually has a very changeable climate, amongst other things, to contend with.

So valuable indeed is the smallest patch of grass in this rock-bound country, that we frequently saw a most luxuriant growth carefully cherished upon the roof of an out-house or stable, where at intervals sheep are hauled up to browse, or hay-making operations are carried on!

On joining the rest of our party at the end of the day at Gudvangen, I found that a friend who had a "net" with him had taken the same species of Lepidoptera as I had, with the addition of a specimen of the angular winged *Argynnis pales* (Schiff.), var. *Lapponica* (Stgr.), an interesting Alpine and northern insect, which he had captured in a small meadow near Vinje.

Whilst steaming down the Sogne Fjord late on the evening of this particular day, we passed some salmon weirs, behind which were some curious long white streaks upon the rocks, looking like water at a distance; on inquiry, we learned that these were painted cascades, made for the purpose of taking advantage of a salmon's well-known predilection for ascending waterfalls; truly a novel way of attracting the fish into the nets!

Our journeyings did not permit of further entomological collecting till we reached the far-famed Romsdal valley; landing at Næs late in the evening, I took my net on shore for the chance of a few insects in the darker hollows of the woods, &c., towards midnight; but when I say that we took a very successful photographic view at 11.15 P.M., and that I made a water-colour sketch an hour later, it will readily be understood that one was hardly likely to capture many moths; indeed, during my trip in Norway I never saw a single Noctua, and conclude that they must arrange their emergence into the perfect state for the spring or autumn, when the days are shorter! The country hereabouts would, I am sure, well repay the thorough investigation of all geological visitors; on the mountain-side close to Verblungnæs no fewer than four well-defined, raised beaches mark successive coast lines; up the valley-moraines, striations, rounded blocks, and all features of glacier action, may be studied to repletion, while every form of disintegration, by air, frost, water, landslips or avalanche, is illustrated most vividly, and on a really cyclopean scale.

Next morning I took my net and a few boxes with me for the drive up to Horgheim. Truly this was the grandest bit of country I had ever collected in, but so impressive and overpowering was the scenery, that one could hardly bring one's thoughts down to so small a thing as an insect. We drove up the fertile valley of the Rauma, carpeted in places with the brightest and loveliest of flowers, well-nigh awed, I may say, by the sight of the huge bare gneiss precipice of the Romsdalhorn disappearing in the clouds on the one side, and the towering crags of the Troltinderner, with jagged pinnacles clear cut against the sky, far above us on the other; far above, I say, for they were 5800 ft., or considerably over a mile high, above our heads, and so precipitous, that I verily believe one could have thrown a stone from the top of the nearer peaks to the bottom of the valley. The winter snows were still lying thick in the hollows, but ever and anon the warmth of the perpetual summer sunshine told upon them, and twice did we see a huge avalanche come roaring down with a noise like thunder, bringing enormous rocks and all sorts of lesser debris into the valley; luckily these avalanches seldom reach as far as the road in summer, but we passed one great rock which had evidently fallen a day or two previously, and which had ploughed across our road and gone crashing through the wood beyond, laying low all the trees in its path.

The woods here were chiefly composed of alder, birch, and ash; here and there we saw a diminutive oak, but the great tree of which we are so justly proud in England cannot in this climate develop into more than a large stunted bush. Although perennial vegetation is so dwarfed, many familiar plants of a summer's growth attain to a wonderful luxuriance, owing to the almost perpetual sunshine they enjoy during their short season; the meadows in this valley were one mass of flowers; there were beds of deep red-purple heartsease growing so thickly that you could hardly see any green between the blossoms, and the latter were fully 1 in. by $\frac{5}{8}$ in size. Yellow-rattle, bird's-foot trefoil, milkwort, eye-bright, globe flower, and other friends at home, were here seen of a most abnormal size and in most luxuriant profusion. Aconite was common in the woods, and many plants quite unknown to us, appeared here and there also; I was quite sorry that I had no time to collect more of them, but of the few brought home and since named, *Cornus Succica* has perhaps proved the most interesting; it is very rare with us, occasionlly occurring in the Scotch Highlands, and is remarkable for its very small, almost unnoticeable, flower, surrounded by four pale white sepals, which appear like four white petals, though of course they are not the flower at all. A friend who was with me also made an interesting find at the foot of the Romsdalhorn, discovering a specimen of the Scandinavian edelweiss (*Antennaria alpina?*) among some rocky debris.

In this land of brilliant blossoms, I naturally

expected to find some interesting insects, and therefore dismounted every now and then from my stolkjærre to look about; "blue" butterflies abounded everywhere, but turned out to be nothing more than the familiar Icarus and Ægon, the latter being the commoner of the two; *C. Pamphylus* was also abundant, varying in no way from the British type; the Fritillaries were represented by *Aglaia*, and I saw one specimen of some other large *Argynnis*, which I failed to run down; my most interesting capture, however, was a beautiful fresh specimen of *Polyommatus Hippothoe*, on a bed of heartsease; verily, this is a lovely insect when just out, with its rich red coppery upper surface, shot with violet reflections; it soon loses its true brilliancy when dead.

Not very far from where I took this beautiful butterfly, snow was lying in drifts ten to fifteen feet thick in shaded hollows.

I do not think I ever saw so many Dor beetles in one day as I did during this drive; these insects have a peculiar Scandinavian association for us, our name Dor being simply a corruption of Thor, the great god of Thunder of our Viking ancestors, whose name is also perpetuated to us in the word Thursday or Thors-day. Our Norse forefathers dedicated this beetle to their god Thor, and are said to have held it in high veneration in consequence; a relic of this survives in some parts of Norway and Sweden to the present day, where the simple-minded peasant will reverently set the poor little beetle upon his feet again, if he finds him lying on his back on the road, passing on with a lighter heart, at any rate, for the kindly deed. Throughout Norway the greatest consideration and kindness is shown for all living creatures, both by young and old.

At a house up the Romsdal valley I saw a fine bear's skin, obtained in the neighbourhood, but the only wild animal I had the luck to see alive was a wild cat, a handsome looking creature, with a bluish-grey fur and thick short bushy tail.

At Molde, a place where we saw a panorama of distant snow-capped mountains lit up by the late evening sun, which was a never-to-be-forgotten dream of purple and gold, I did not manage to do any entomological collecting, as the country was soaked with recent heavy rains; the flora of the neighbourhood, however, was wonderfully varied, and vegetation generally marvellously luxuriant. On the hill behind the town I was delighted to find *Linnæa borealis* growing very abundantly; this pretty little creeping evergreen, a near ally of the honeysuckle, with its gracefully pendent white flowers, was the special favourite of the great botanist whose name it bears.

An interesting though necessarily very saddening sight which I was permitted to see at Molde, was the large Lepers' Hospital. One is accustomed to read of this dreadful disease in the Old Testament Scriptures with a vague notion that it was a scourge of olden times, having no connection with the nineteenth century; a visit to the wards at Molde, however, distressingly dissipates this idea.

Neither at Trondhjem, nor in the Geiranger, had I any opportunity of using my net again in pursuit of butterflies, but, *apropos* of the latter, I may mention a seemingly rather favourite ornamentation of crosses in the graveyard of Trondhjem Cathedral; one might almost suppose that Butler's "Analogy" had been translated into Norse, and was a book much studied in the district, for above the inscription on the headstone was frequently engraved his well-known emblem of Life and Immortality—the grub and the butterfly. This was, at any rate, an interesting fact which could not fail to catch the eye of an amateur entomologist.

A call in at Bergen again completed our short trip in "Gamle Norge," and, in conclusion, I can only say that any naturalist with time at his disposal would find in this glorious country most delightful fields for collecting and investigating, amidst the most wonderful and verily grand and awe-inspiring of scenery; he will probably on his first visit, however, as I myself did, find the scenery so completely absorbing of his receptive faculties, that he will scarcely succeed in taking in many minor details of the country.

On looking over the few entomological captures I brought home with me, it strikes me as rather a curious thing that, while the long hours of sunshine certainly have such a marked effect upon all flowers in Norway, making them grow to such an abnormal size, and with such extraordinary luxuriance, insect life does not seem to be affected to any appreciable extent in the same way; probably, however, the excessive moisture of the climate, which is beneficial to plant life, serves to check insect development.

It is a somewhat remarkable circumstance, too, that although the prolonged sunshine makes all the flowers much brighter in colour, and their scents also very much more powerful than in England, the fruits that ripen in Norway have, for the most part, a decidedly inferior flavour to those grown in this country.

THE INFLUENCE OF GEOLOGY ON POPULATION.

By G. W. Bulman, M.A.

THE influence of the geological structure of a country makes itself felt in various directions. It shows itself in the scenery, and determines whether a district shall be flat and tame, gently undulating and picturesque, or rugged and grand; it settles which shall be the dominating species of tree, and affects likewise the humbler vegetation; it is an element in the formation of climate, and may largely affect the rainfall; finally, it has no small influence on the population.

If we draw on a map of Great Britain a line from

the mouth of the Tees to Lyme Regis in Dorset, we cut off on the east a roughly triangular portion, containing nearly all the geological formations newer than the Permian. At the same time, we isolate almost the entire region where the nightingale is to be found in this country. This emphatically suggests some geological influence on the distribution of the bird, the exact nature of which does not appear to have been determined.

And as geology has affected the minor population, so also has it influenced the human. The distribution of the various settlers in Britain—Celts, Saxons, Danes, and Norwegians—shows some striking dependence on the geological structure of the country.

To determine the various areas occupied by these races, the most reliable method has been found to be the study of place names. Where the population has remained Celtic, the root-words in these appellations are mostly in that language, whereas Danish and Norwegian settlers gave their towns names from their own speech. An examination of the names of towns and villages, then, gives data for the construction of a map, coloured according to the different languages from which the place names come. Such a map shows, in the most exact manner possible at present, the districts occupied by the various tribes. A chart of this kind is to be found in Taylor's "Names and Places," showing the distribution of the various tribes of settlers in the British Isles. On comparing it with a geological map of Britain, we are struck by the remarkable way in which the geological structure seems to have determined the areas occupied by the Celts, the Danes, and the Norwegians.

On the former map, the yellow, denoting Saxon names, has driven the red, or Celtic, into the two districts of Wales and Cornwall.

This red area in Wales coincides roughly with the Silurian and Cambrian of that district; while that of Cornwall is approximately the Old Red Sandstone, with frequent patches of granite, which forms the south-west corner of England. It is easy to see why these districts were chosen as places of refuge by the fugitive Britons. Both are rough, mountainous regions, abounding in deep valleys, and steep hills; and, in ancient times, with impenetrable forests. In them the Britons found a safe retreat from the fierce Saxons. And it is the geology of these regions which made them thus suitable and preserved the Celtic race in England from extinction.

The Cambrian and Silurian rocks are our oldest formations, except the Archæan. Long exposed to the weather, and the general vicissitudes of time, and lying often at high angles, they have been cut into numerous deep glens, high rugged crags and splintery peaks; while volcanic agency has likewise helped to produce a wild and rugged region.

In Cornwall the old red sandstone, which does not as a rule produce the grand and rugged scenery of the Cambrian and Silurian, has been broken up by mighty intrusive masses of granite; and the combination has produced a region of wild and lofty hills, well suited to provide a refuge for the fleeing Celts. A similar influence has preserved a large area in Scotland, north of the Forth, to the ancient Celtic population.

The next thing to be noted on the map, is the fact that the green, indicating Danish settlements, is all on the east coast; while the blue, indicating Norwegian, is on the west. Both penetrate inland in many places. The former range from Suffolk to the mouth of the Tees, with a few small areas scattered about further north and along the south coast, etc. The latter are indicated on the map from the Shetland and Orkney islands down the west coast, continuously at first, and then at intervals, as far as the north shore of the Bristol Channel. On the east they only occupy Caithness and Sutherland, with a few small and scattered areas extending as far south as Peterhead. No indications of Danish settlements appear on the west coast, and none of Norwegian on the east, except in the north of Scotland. These distinctions as to inhabitants coincide remarkably with the geological difference in the two coasts. The latter present a striking contrast, owing to the varying nature of the rocks. In Great Britain the older rocks lie in the north-west, and as we proceed in a south-east direction, we pass continuously from older to newer formations. Consequently, from the extreme north of Scotland to the Land's End scarcely any newer rocks than the Permian enter into the formation of the west coast-line. On the other hand, from the mouth of the Tees southwards we find no rocks older than the Trias forming our eastern shore.

Thus it appears that the Norwegians chose the regions where the older rocks opposed their time-worn cliffs to the waves, while the Danes were drawn towards those parts where the sea washed the less imposing barriers of chalk, mud, and sand of the younger rocks. Let us inquire, then, if this geological difference can in any way account for the Norwegian's choice of the west coast, and the Dane's partiality for the east. It is clear we cannot attribute it to chance, for the settlement of the Northmen in England was not by one, but by many invasions.

If we compare the west coast of Scotland with that of Norway, we see at once a striking similarity. The numerous long, deep, and narrow fjords of the latter are faithfully reproduced in the extensive sea-water lochs, which indent the coast of the former at frequent intervals. Each coast line, moreover, is studded with numerous small islands. The rocky and deeply indented nature of Scotland's west coast is due to the same cause as the rough and rugged scenery of Wales. Those narrow arms of the sea, running inland for such long distances, represent the deep valleys; while

the lofty hills appear as towering cliffs, and craggy islands. And, when we turn to a geological map of Norway, we find that it is almost entirely occupied by Cambrian and Silurian rocks; the coast of Norway is geologically the same as the west coast of Scotland. We may then infer that the Norwegian invaders chose our west coast because of its similarity to their own, and we know that the resemblance is due to geological structure.

And can we offer a similar explanation with regard to the Danish choice? The country most thickly peopled by the Danes extends from the mouth of the Tees to the Naze in Essex. Of this, the region from the Tees to the Great Ouse is the most thickly studded with Danish names. Two-thirds of this latter extent is composed of recent drift and alluvium, and the remainder almost entirely of Liassic and Oolitic rocks. Flamborough Head and the Norfolk coast are Cretaceous; the remaining part, southwards to the Naze, the Tertiary rocks of the London basin. Hence we have on the line occupied by the Danish settlers a large extent of flat coast, cliffs not lofty, and no deep indentations such as we find on the west coast. Looking at an ordinary map of Denmark, we are struck at once by the peculiarity of its coast-line. The sea penetrates into the heart of, and at times almost across, the country; narrow spits of land cut off, or almost cut off, small areas of ocean; lakes are thickly studded over the interior, and there are no high mountains. All this suggests an absence of the older geological formations, and a land recently elevated from the sea. And on consulting a geological map, we find that with the exception of a few patches of Cretaceous rocks, Denmark is entirely Tertiary. So it appears the Danes chose that portion of the British coast which most resembled their own low-lying shores.

Yet another geological element has exerted an influence in determining roughly the ultimate extent of territory occupied by the Danes. This influence is due to that barrier of Magnesian limestone which stretches with a gap of twenty miles immediately south of the Tees, like a wall from the Tyne to the Trent, where the latter begins to take its final northern bend. In a roughly approximate way this barrier has bound in the Danish settlers. Through the gap on the south of the Tees the green of the Danish district on the map swells out westward to meet and mingle with the Norwegian blue, spreading eastwards from the coast of Cumberland. And again, where the magnesian barrier ends at the river Trent, the Danish settlers have spread out south-west towards the Bristol Channel.

This coincidence, it has been hinted, is only rough, but the two bulgings out westwards through the gap and below the wall are most striking. A large portion of Central England to the west of it is, in fact, left comparatively free from Danish influence on its place names.

Such are the results which suggest themselves, on a cursory comparison of the geological map with one coloured according to the prevailing nationality, as determined by place names.

They show that geology has had some share in deciding the areas to be occupied by the different nations. The part which the geological structure of a region has had in moulding the character and physical development of the people opens out another interesting field of inquiry.

Corbridge-on-Tyne.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Aluminium.—The production of aluminium is steadily progressing in the direction of cheapness. If its future history shall correspond with the past history of many other chemical manufactures, it may ere long become sufficiently cheap to enter into the composition of ordinary domestic utensils, and largely to take the place of copper and brass. If it thereby hastens the ruin of commercial conspirators who are rigging the copper market, all respectable men of business will be thankful to it.

The combination of tenacity with lightness which is the characteristic of this interesting metal, constitutes its chief merit. A multitude of uses will arise from this combination immediately the price is sufficiently reduced.

It should be remembered that its low specific gravity is practically an element of cheapness. Copper, bulk for bulk, is more than three and a half times as heavy as aluminium, silver four times; therefore aluminium at 3*s.* per lb. is practically as cheap as copper at tenpence, seven aluminium kettles of given size will weigh less than two of copper, besides the economy in handling. Four aluminium spoons of given size, will weigh less than one of silver.

I should here correct a rather common mistake. In newspaper references to this subject, the writers frequently describe clay as alumina, or the oxide of aluminium. Even in a well-established text-book on geology, I find enumerated among the constituents of rocks "alumina or pure clay," and in an old Dictionary of Geology we are told that "When clay is quite pure and unmixed it is termed alumina." Pure clay has a far more complex composition. It is a hydrated silicate of alumina, *i.e.* a compound of solid water with the oxide of silicon and alumina. Neither alumina nor silicate of alumina (whether wet or dry) has the characteristic plastic properties of clay. If clay were mere alumina, the problem of making aluminium would be materially simplified.

The Mandrake.—In a recent number of "The Asclepiad" (2nd quarter, 1888), Dr. Richardson has an interesting article on this subject. The facts he

states show very plainly that the use of anæsthetics for annulling pain in surgical operations is but a revival of an ancient practice, and that the mandrake (*Atropa mandragora*) was one of the most popular agents.

> "Give me to drink mandragora
> That I might sleep out this great gap of time."

exclaims Cleopatra during the absence of Mark Antony, and Iago says, when he had duly poisoned the mind of his confiding master,

> "Not poppy nor mandragora
> Nor all the drowsy syrups of the world
> Shall ever medecine thee to that sweet sleep
> Which thou ow'dst yesterday."

Dr. Richardson with some difficulty obtained a specimen of the root, and from it prepared the "Wine of Mandragora" according to the ancient recipe. His experiments show that the ancient reputation of this preparation was well founded as far as its anæsthetic properties are concerned, that it is "a general anæsthetic of the most potent quality," and he has no doubt that its active principle, if isolated, would be "one of the most active anæsthetics we have yet discovered." This is not all, it possesses the valuable property of producing long continued local insensibility. Dr. Richardson found that, on applying the tincture to his lips the insensibility was very decided, and lasted for more than an hour.

Some of our very numerous aspirants in organic chemistry will do well in separating the alkaloid or whatever else the active principle of the mandrake may be, and studying its compounds.

As regards the difficulty of obtaining specimens, I may mention a fact that came under my notice two or three years ago. The driver of one of the Harlesden omnibuses on which I was riding, drew from his pocket a piece of what appeared to be horse-radish, and told a long story concerning the wondrous medicinal virtues of this root which he called the mandrake. He used it by scraping, and chewing the shavings. Its appearance corresponded to the drawings I have seen, excepting that it lacked the bifurcation supposed to represent the legs of a man. He obtained it from a herbalist and always carried it, supposing that he thereby rendered himself proof against infection.

SCIENCE IN TURKEY.—A report on the Climatology of Constantinople, based upon the results of twenty years' observations made at the Imperial Meteorological Observatory by command of the Sultan, may appear surprising to some people who have been deluded by factious falsehoods into the belief, that the "unspeakable" Turk is a creature incapable of scientific or any other progress. M. Coumbray, Director of the Constantinople Observatory, issued between 1868 and 1874 a monthly bulletin, including the results of observations made in this and the other observatories of the Ottoman Empire.

The recent report for 1887 refers mainly to Constantinople, where the minimum temperature was 17°·2 (January, 1869) and the maximum 99°·1 (August 1880), a range of 82°. This is considerable, but the climate of Odessa is far more severe, the temperature in winter commonly falling more than 20 degrees below that of Constantinople where the worst climatic trouble comes with a S.E. wind, the Sirocco or Samiel, which is a diluted simoom blowing from the desert. I spent June and July there many years ago and found myself prostrated with severe headache and lassitude, which led me to suppose that I was sickening for fever. It lasted just three days, and the first intimation I obtained of its real cause was the inquiry from an Englishman of greater experience in Eastern travel, who asked me how I had pulled through the sirocco.

PROTECTION FOR FISHES.—The Liverpool Marine Biology Committee made a holiday cruise at Whitsuntide which must have been very interesting to the naturalists. Among other proceedings they practically tested the effect of the electric light as an adjunct to fishing, by lowering at night two nets under similar conditions, excepting that one was near to a sunken electric light, and the other on the dark side of the same ship. After being out for three-quarters of an hour the nets were hauled in. That which had been towed in the dark contained practically nothing; the illuminated net contained an abundance of crustacea, especially of free-swimming species. The experiment was repeated with modifications, the results in all cases showing that the light adds greatly to the power of the fishermen. Besides these, other experiments have been made where true fishes, vertebrata, were concerned, and all with similar fatality. Practically, such luminous decoy is but a refinement on the old Norwegian method of salmon-spearing by night, with a blazing wood fire overhanging the bow of the boat.

It does not appear that this electric bait has yet been commercially used on a scale of any magnitude, but if it does come into extensive use, it will add to the existing necessity for legal restrictions to sea fishery, in the limitation of reckless capture of young fishes, or rather of fishes that have just passed through the natural dangers of infancy, and are entering upon that stage of life when they may escape their ordinary enemies, and rapidly grow to become valuable food-material for ourselves. This protection may be afforded, by specifying a minimum size of certain fishes that may be exposed for sale. If, for example, the fishermen could find no market for "slips" and "grilse," their own interests would be sufficient to induce them to return these to the water, in order they might become soles and salmon.

THE RECALESCENCE OF IRON.—This is a curious and obscure subject. In the course of cooling from a white heat, some samples of iron appear at certain temperatures to start into an increasing glow. Mr.

H. Tomlinson has endeavoured to throw some light upon the mystery by testing the variations of internal friction of the metal at different temperatures, the method adopted being that of suspending a wire vertically, heating it by an electric current, and noting the period of horizontal vibration when the wire is twisted. At 550° (Centigrade) the internal friction rises rapidly, and still more rapidly at 1000°, at which temperature the wire comes to rest after two or three vibrations. From 1100° to 1200° it seems to decrease. At 550° the magnetic and thermo-electric properties also change. At 1000° heat also becomes latent. When iron has been strained by bending or hammering, the strained portion appears clouded as the cooling proceeds. This is attributed to the more rapid cooling of the strained part, which, according to Mr. Tomlinson, has a lower specific heat than the unstrained portions. In well-annealed iron recalescence cannot be detected.

RAPID EVAPORATION.—If I remember rightly it was Sydney Smith who defined woman as a biped who refuses to reason and who lights a fire on the top. Woman was avenged when it was proved that the best method of preventing smoke and economising fuel in an ordinary open grate is to light the fire at the top and allow it to gradually burn downwards. By doing so the hydro-carbon vapours generated in the first stage of combustion of the coal, have to pass through the fire above, and are there completely burned with full supply of oxygen, and therefore no smoke is generated. This proceeding corresponds to that of firing a boiler furnace by pushing the fully incandescent fuel farther back on the long bars and supplying fresh fuel in front.

A German chemist, W. Hempel, has carried the feminine paradox still further. He finds that the most rapid and generally effective method of evaporating liquids, is to apply the heat above their surface instead of at the bottom of the vessel containing them. For this purpose he uses a Siemens' inverted regenerative gas-burner, (other inverted burners, of which so many are now in use, will answer the purpose,) bringing the flame as near as possible to the surface. There is no ebullition and consequently no spirting, an important advantage in many chemical operations, especially where evaporation is involved in an analytical process. He finds that no appreciable amount of sulphurous acid from the gas is absorbed by the liquid.

THE SPECIFIC GRAVITY OF LIQUIDS.—A. B Taylor ("Chemical News, vol. li. p. 138) proposes a very simple method of ascertaining this. It is to take a solid of known specific gravity, and of this weigh as many grains as correspond to its specific gravity, and then weigh it in the liquid to be tested. The loss of weight in grains expresses the specific gravity of the liquid.

The principle of this will be understood by remembering, that specific gravity tables express the weight of a given bulk of solids and liquids as compared with an equal bulk of distilled water. Therefore if Mr. Taylor's method be applied to distilled water, the result will be unity, whatever solid be used. If, for example, the specific gravity of the solid be 1·0, it means that bulk for bulk it weighs the same as water, therefore, if one grain of this is weighed in water it will displace exactly its own bulk of water and neither float nor sink, will weigh nothing in the water, *i.e.* will lose one grain. The specific gravity of platinum is 21½. Therefore 21½ grains will have exactly the same bulk as the solid above supposed, or that bulk of water, and the loss again will be 1. But if the liquid were, say 1½ times as heavy, bulk for bulk, as distilled water, this bulk of platina will have to displace or push upwards 1½ times as much weight of fluid in order to put itself below its surface, and thus will lose 1½ grains of weight in such liquid as against the one grain lost in water.

NOTES ON *PHTHIRIUS INGUINALIS.*

TWO or three specimens of this insect were sent to me to be mounted. On examination one of them proved to have feet of what I take to be a

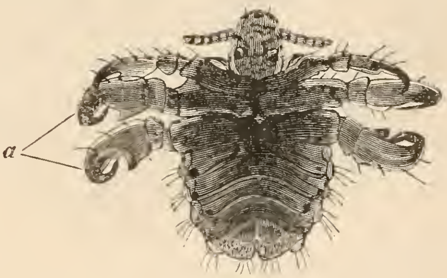

Fig. 75.—(*a*) External and internal terminal claws. *P. inguinalis.*

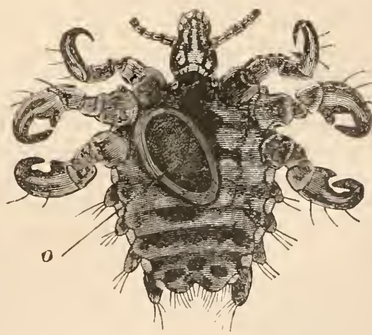

Fig. 76.—(*o*) Ovum? *P. inguinalis.*

somewhat peculiar structure. Within the terminal joint of each foot there is a terminal claw, which is rather longer than the external terminal claw. This

difference in length is most marked in the anterior pair of legs, employed by the insect in walking; but it is also observable in the posterior (climbing) pairs of legs.

I have compared the mount in question with a specimen independently prepared by Mr. W. M. Osmond, a member of our Microscopical Society here, and with two other specimens mounted by me; also with a carefully executed drawing from a German preparation; in none of them, however, is there any double claw. Mr. Osmond employed caustic potash in cleaning his object; in all of my slides I adopted Mr. Jackman's process for mounting a tape-worm (*vide* "The Microscope" for January last, p. 5), which, in the few instances in which I have tried it,

Fig. 77.—Terminal claw of second pair of legs, showing internal claw attached to muscle, and longer than external claw.

has answered well for small insects. My objects were perhaps not sufficiently flattened to admit of their being clearly focussed all over, but I am responsible for this feature. Does the insect in question moult, and was this specimen secured at an opportune moment?

The photographs which illustrate this note have been expressly taken for it by Mr. Osmond; it seemed to us that in a matter of this kind photos would be accepted, as being more reliable than hand drawings.

In two specimens we have observed a long oval body (shown in one of the photos I enclose): is it an egg? I have a drawing of the abdomen of a choice sample of *Cimex lectularius*, which contained no less than six unmistakable ova: I examined it in pure carbolic acid as a medium; and it brought the ova to view with wonderful clearness.

Calcutta. W. J. SIMMONS.

ON THE DISTRIBUTION OF AQUATIC FORMS.

By T. D. A. COCKERELL.

IN my previous paper on Geographical Distribution I dealt almost entirely with terrestrial species, and did not speak of those inhabiting the sea. I now propose to consider some of the more noteworthy facts concerning the distribution of aquatic forms, dealing, as before, mainly with those which inhabit the British Isles.

The wide distribution of freshwater species is familiar to every naturalist, and was fully recognised and insisted upon by Darwin,* who attributed it mainly to the agency of birds. Some are universal, as for instance *Chara fragilis*, which is "found in every country and clime, in ice-water at the north, and in the hot springs (boiling water) of the Yellow-stone."† But here it must be remembered that Chara is a Cryptogam, and the universal distribution of many terrestrial cryptogamia is well known. Mr. C. R. Orcutt has sent me an interesting list of the flora of Southern and Lower California, which includes a large proportion of freshwater plants common to Britain; for instance, the three species of Potamogeton quoted are *natans*, *pusillus*, and *lucens*, and the three Lemnaceæ include *Lemna trisulca* and *L. minor*, species which I have also found in Saguache Creek, Colorado. *Callitriche verna* is likewise a Californian plant.

Freshwater sponges are widely distributed, one of the most extraordinary instances being that of *Meyenia plumosa*, which occurs of the typical form in Bombay, and reappears as the var. Palmeri along the banks of the Colorado River, in North-Western Mexico.

A genus of Trichoptera, Helicopsyche, is world-wide, being found in Europe, America, New Zealand, &c., and the larvæ of these insects live in streams, encased in a shell, resembling very closely that of the Molluscan genus Valvata. Probably these larvæ are distributed by birds, as it is incredible that the perfect insect should have the power to cross wide tracts of ocean, or even great distances on land; and it has come under my own observation in Colorado, that wild ducks (*Anas bosca*) greedily devour these larva-cases, containing the living larvæ.

But it must not be supposed that freshwater species, even the most widely distributed, are not prone to vary.

Every conchologist is aware of the immense and puzzling variation in such genera as Limnæa and Pisidium, not so much in species whose range is

* "Origin of Species," 6th ed. 1882, pp. 343–347.
† "Botanical Gazette," 1888, p. 67.

restricted, either, as in those which inhabit many countries and both hemispheres. In plants, the genus Potamogeton, for instance, is such as to puzzle the most skilful, and even in Ranunculus, the terrestrial forms of which are fairly well-defined, the aquatic species or sub-species defy classification.

Of freshwater fish, the Salmonidæ offer sufficiently good examples of variation; for instance, the trout of Great Britain and Ireland, all referred by Dr. Day to *Salmo trutta*, are divided by Dr. Günther into no less than *eleven* species; so that it evidently becomes a question, as with most other freshwater genera—Are we to say that the genus is a large one including many species of very restricted range, or a small one with few species of very wide range?

The Trichopterous *Philopotamus montanus*, again, is an analogous case. This insect has a variety, Scoticus, which Mr. King found near Killarney, in the same district as the typical form, but confined to a single stream, where the type did not occur. Further, there are two other forms of *Philopotamus*, *cesareus* and *insularis*, peculiar to Jersey and Guernsey respectively, and which, it would appear, may either be considered species or varieties of *P. montanus*, according to the view taken of the limitations of these terms.

It seems therefore to me, reviewing all these facts, that the bare statement that freshwater forms are very widely distributed does not convey the exact truth of the matter; but rather we should say that the races are not so well defined, and merge more into one another than is the case with terrestrial forms, and hence what might, if all connecting links were destroyed, be considered a genus of many species, becomes a single widely-distributed species with endless varieties.

The explanation of this may probably lie in the fact, that freshwater species cannot spread as gradually as if they were on land; but are conveyed from pond to pond, river to river, or river to pond, as chance may have it, and nearly always the new habitat differs somewhat from the old, whether in the flow or constitution of the water, or the nature of the food, so that it is clear that only the most pliable species, which readily adapt themselves to new conditions, would stand a good chance of surviving.

This theory may throw some light on the extraordinary difference between the freshwater mussels (*Unio* and *Anodonta*) of Europe and America. In Europe we have a few species belonging to each genus, presenting innumerable and puzzling varieties, but in America hosts of more or less well-defined species. This enormous abundance of specific forms in America as compared with Europe has been attributed to the diversity of geological changes supposed to have occurred in America, and the consequent isolation of forms. I attribute it to precisely reverse conditions—the great basin of the Mississippi, in which most of the species are found, is connected throughout, and nearly fulfils the conditions of a terrestrial area in the opportunities it offers for gradual migration; whereas in Europe there are many river systems, distinct, yet of no great size, such as those of the Seine, the Thames, the Rhone, the Garonne, and an endless host, all of which must be peopled from each other by sudden and not by gradual migration.

Paradoxical as it may seem, that isolation should prevent the development of many species, I am forced to this conclusion as to freshwater forms by the facts before me, and I shall look eagerly for any comments which naturalists may be able to afford on the subject, tending to prove or disprove my conclusions.

Now to come to the second part of my subject, the distribution of species inhabiting the sea. Those of the British coasts may be divided roughly into northern and southern, yet their origin must have been from many sources, which we can only dimly trace at present. A resemblance has been noted between the marine crustacea of South America and of Britain, which may possibly be due to the Gulf Stream peopling our shores with types from America, while it seems not unlikely that land once existed at an intermediate point, if there was no terrestrial connection.

Floating species are sometimes world-wide. I have seen examples of *Spirula peronii* and *Ianthina exigua* from New Zealand, and these same shells are occasionally washed up on the western coasts of the British Isles. The marine mollusca of the northern and southern temperate zones bear a remarkable likeness to one another, being for the most part of identical genera and very similar in appearance, though there are of course many notable exceptions.

The distribution of many species of univalve mollusca appears to be very largely influenced by warm and cold currents of water, as the Rev. A. H. Cooke pointed out to me in the case of the genus Purpura, in which this obtained both in the Atlantic and the Pacific. Central France was at one time probably submerged, and an open connection existed between the Bay of Biscay and the English Channel and the Mediterranean, as seems probable from the Mediterranean character of many of the pliocene fossils found at St. Erth, Cornwall, and from Dr. Gwyn Jeffreys' account of the deep sea mollusca of the Bay of Biscay.—All these various points are worthy of careful and detailed investigation; I merely mention them here, but their consideration in detail would fill a book.

Boreal marine species are circumpolar, and, frequently following the coast-line of continents, appear where one would hardly expect them. Let us take, for instance, the Pacific coast of North America. W. H. Dall gives a list of the mollusca found on the expedition to Point Barrow, Alaska, and this includes

Trichotropis borealis, *Cylichna alba*, *Mya truncata*, and other well-known European species. This is exactly what we might expect, from the northern character of the locality, but surely Southern California would possess no European shells? On the contrary, many of its genera are also European, and Mr. C. R. Orcutt found *Bulla vesicula* (considered perhaps a variety of hydatis), *Pholas crispata*, *Saxicava rugosa*, and *Lasea rubra* in the vicinity of San Diego, as well as *Mytilus edulis*, a species not only common to Europe but to the Pacific coast of South America, but which may possibly have been introduced from its habit of clinging to the bottoms of vessels. Also, a little Brachiopod, found at San Diego and Todos Santos Bay, was referred by W. H. Dall to *Platidia anomioides*, a species found in the Mediterranean, North Atlantic, and Caribbean sea, though whether this indicates a boreal origin, or an ancient disconnection of North and South America, I cannot say; the latter theory is favoured by Dr. Günther's statement, that about 30 per cent. of the fishes are identical on both sides of the Isthmus of Panama.

The marine algæ of California, like the mollusca, include some European forms, and a list of those collected by Mr. D. Cleveland at San Diego enumerates such familiar species as *Enteromorpha compressa*, *Corallina officinalis*, *Fucus vesiculosus*, *Plocamium coccineum*, *Ulva latissima*,— all of which I have myself collected at Margate on the Kentish coast.

Much that is interesting may be elucidated from a study of the distribution of species on various parts of the British coast. Many mollusca that are common in Cornwall and the Channel Islands do not range to the other end of the English Channel, and are unknown in Kent: such are *Trochus lineatus*, which takes the place of *Littorina littorea*, in the western part of the Channel, *T. magus*, which extends as far east as Hastings, and many others. Species thus ranging over the western portion of the Channel extend further east on the French than on the English coast, a noteworthy instance of this being *Donax trunculus*, which, though south-western and very rare in England, is found on the north-east coast of France and in Belgium.

In comparing the lists of the marine shells of Kent, Scilly Isles, and Yorkshire and Durham, I was struck by the fact, that a number of species common to Scilly Isles and Yorkshire and Durham are unknown in Kent. How this most unexpected circumstance is to be accounted for, I do not know, and I very much regret that the almost total lack of records for Lincolnshire, Norfolk, Suffolk and Essex renders it impossible at present to trace how far these species descend on the eastern coast. It is much to be desired that conchologists having knowledge of the occurrence of such species as *Pecten tigrinus*, *Philine scabra*, *Scalaria turtonæ*, *S. trevelyana*, &c., on the coasts of any of these counties will place the fact on record, and any records whatever from the eastern coast between Yorkshire and Kent would be of exceptional value.

In the present paper I have only been able to indicate lines of enquiry, which may be followed out, as circumstances allow, in the future. To do this, it is necessary to examine as many local lists as possible, and I shall be very greatly indebted for the loan of any such, and will do whatever may be in my power in return for such assistance. I venture to hope that others, having better opportunities than I, will give some attention to the distribution of species round the British coasts, so that there may be a better understanding of the true relations of the various local faunæ.

West Cliff, Custer Co., Colorado.

LIST OF BRITISH TABANIDÆ, WITH NOTES.

By E. Brunetti.

The British species of Tabanidæ, though few in number, seem to be very little understood by students of Diptera, owing probably to the species being very closely allied, their great variation, and the extraordinary confusion existing in the synonymy.

Professor Brauer's elaborate monograph on this family (1880) has completely cleared up the confusion, and I now venture to give a list of our British species, adding such notes as may appear of interest.

My best thanks are hereby tendered to Mr. Verrall and Dr. Mason for very kindly placing their collections at my disposal, and also to Mr. C. Dale and Dr. Meade for much information on this group. The collection of the Entomological Club (through the kindness of Mr. B. Lowne), and the British Museum collection, have also been carefully examined, nearly a thousand specimens having passed through my hands.

Schiner, in 1868, admitted 1122 species in this family, 106 or thereabouts being European. Nine genera are European, five being represented in Britain.

I. Tabanus, Linn. 1766.

Linn. Sys. Nat. (1766).

1. *T. bovinus*, Linn. 1766.—Linn. Sys. Nat. ii. 1000; *tropicus*, Harris; *larva*, De G. Ins. vi. 6.

This is usually considered the commonest species, but it is much less common than the next species, *T. Sudeticus*, which is very frequently mistaken for *bovinus*. In Dr. Mason's collection I found a very small ♂ measuring only 18 mm.

2. *T. Sudeticus*, Zell. 1842.—Zell. Isis (1842), 815, pl. i. 5–8; *bovinus*, Mg.

Professor Gobert thinks this a variety of *T. spo-*

dopterus, Mg. Mr. Verrall first called the attention of entomologists to this being a British species, though Mr. Newman recorded the capture of a series without mentioning any authority for the identification of the species.

3. *T. autumnalis*, Linn. 1766.—Linn. Sys. Nat. ii. 1000; *bovinus*, Harris.

Some males of this species were placed in the British Museum collection as *paganus*, Fab., till I pointed out the error. One rare variety of this species has clear wings and black tarsi; I found one in Dr. Mason's collection, and one in that of the Entomological Club, where it was labelled *glaucopis*, Mg. The males sometimes resemble *Therioplectes solstitialis*, but may at once be recognised by the bare eyes.

4. *T. Græcus*, Fab. 1794.—Fab. Ent. Sys. iv. 368; *ferrugineus*, Mg.; *ursulus*, Mgrle in Mg.; *fulvicornis*, Schi.; *Liburnicus*, Wied. in litt.; *propinquus*, Palm.; *infusus*, Walk.

Very rare. One in Mr. Verrall's collection.

Professor Pandellé thinks *apricus*, Mg., a variety of this species.

5. *T. glaucopis*, Mg. 1820.—Mg. Sys. Bes. ii. 48, ♂; *lunulatus*, Lw.; *cognatus*, Lw.; *ferrugineus*, Mg.; *flavicans*, Zell.

Very rare. Three in Mr. Verrall's collection, and one in the British Museum.

6. *T. bromius*, L. 1761.—Linn. Sys. Nat. ii. 1001; *autumnalis*, Harr.; *maculatus*, De G.; *glaucus*, Mgrle.; *glaucescens*, Schi.

This species often makes fields quite impassable, owing to its great abundance occasionally, and its persistent attacks on man. The Rev. J. G. Wood recommends smearing paraffin round the neck when collecting, as the only preventive from their bites.

The male is much less common than the female. A specimen labelled *glaucus*, Mg., said to have been thus named by Walker, is only a variety of *bromius*.

7. *T. maculicornis*, Zett. 1842.—Zett. Dip. Scan. i. 117; *borealis*, Mg. ♂; *nigricans*, Egg.; *glaucescens*, Schi. ♀; *bromius*, var. Loew.; ? *Miki*, Brauer.

This not uncommon species may be distinguished from *bromius*, its nearest ally, by the dull leaden colour of the abdomen, which is grey, or tawny-grey, in *bromius*.

In Professor Brauer's illustration he shows a row of hairs on the upper side only of the first antennal joint, but in my specimens the joint is equally hairy all over. In one large ♀ in the Entomological Club collection the branch of the third longitudinal vein is forked, as in the genus *Atylotus*. Walker says this is often the case in *Tabanus* (with which he incorporated *Therioplectes* and *Atylotus*), but this specimen is the only one that I have seen presenting this peculiarity (except in true species of *Atylotus*).

8. *T. cordiger*, Wied. 1820.—Wied. in Mg. Sys. Bes. ii. 47; *atricornis*, Mg.; *latifrons*, Zett.; *megacephala*, Jaen.; *vicinus*, Egg.; *anthracinus*, Walk.

This species is liable to be confounded with *bromius*, L., from which it may be distinguished by the abdominal spots being hoary instead of yellowish-grey; with *maculicornis*, Zett., from which its blacker abdomen and eyes bare of a coloured band in life will distinguish it. It also resembles *Therioplectes montanus*, but can be separated from this species by its bare eyes and the absence of tawny spots on the basal abdominal segment.

II. Therioplectes, Zell. 1842.

Zell. Isis. (1842) 815.

This genus has pubescent eyes, and may therefore at once be distinguished from *Tabanus*.

Baron Osten Sacken, Schiner, and Brauer, still rank this and the next genus as sub-genera only of *Tabanus*.

1. *T. montanus*, Mg. 1820; Mg. Sys. Bes. ii. 55. Rather rare.

2. *T. micans*, Mg. 1804; Mg. Sys. Bes. ii. 34, pl. xiii. 20; *Austriacus*, F. Walk.; *signatus*, Pauz.; *niger*, Donov.

Rather rare. Closely resembling the *bisignatus* var. of *T. tropicus*, L., from which the black tibiæ separate it.

Wiedman's *Austriacus* is not this species. In Dr. Mason's collection I found a var. (? distinct species) with a short and rounded abdomen, and thick hair (black in ♂, brownish-grey in ♀) on the under side of the head.

3. *T. tropicus*, L. 1761.—Linn. Sys. Nat. ii. 1001; *bimaculatus*, Mcq.; *signatus*, Schi.; *borealis*, Jaen.; *bisignatus*, var. *melanochroitica*, Jaen.; *luridus*, Lw.

The *bisignatus* variety is not rare in Britain, but very scarce on the Continent. Were it not fcr Professor Brauer holding a different opinion, I should have ranked this variety as a separate species. In one specimen in the British Museum collection the wings are entirely clear, with an entirely tawny first antennal joint.

The ♂ is much rarer than the ♀, and is less subject to variation. Some of Zetterstedt's varieties of his *borealis* may possibly be this species. It somewhat resembles *Tab. Græcus* and *T. glaucopis*, but the pubescent eyes will easily distinguish it from either. Common.

4. *T. solstitialis*, Schi. 1862.—Schi. F. Aust. i. 30; *tropicus*, Lw.; *luridus*, Walk.

Professor Pandellé seems inclined to consider *tropicus*, L., and *solstitialis*, Schi., as the same species, and hints at merging *T. montanus* also. In one variety the abdomen is very conical (♂), the dorsal black stripe very narrow, and the wings darker than usual, the size being smaller than in the type. Common.

III. Atylotus, Os. Sack. 1876.

Os. Sack. Mem. Bos. Soc. ii. part 4, no. iv. 421–479.

1. *A. rusticus*, L. 1781.—Linn. Sys. Nat. ii. 1000; *Italicus*, F.

Rare and local. Common in many parts of Europe.

2. *A. fulvus*, Mg. 1820.—Mg. Sys. Bes. ii. 61; *alpinus*, Schr., Curt., Walk.; *rusticus*, Pauz.; *ferus*, Schr.; *sanguisorba*, Harr.

Closely allied to *rusticus*, of which Pandellé thinks it a variety. The ♂ is very rare. The colour of the legs varies to a very great extent. Rare.

IV. Chrysops, Mg. 1803.

Mg. Sys. Bes. ii. 65.

1. *C. cæcutiens*, L. 1766.—Linn. Sys. Nat. 1001; *lugubris*, L.; *viduatus*, F.; *nubilosus*, Harr.

Professor Pandellé merges *C. sepulchralis*, F., as a variety of this species, but they seem to me distinct. He also ranks *relictus* and *quadratus* to varieties also. Both of them, however, are undoubtedly good species.

2. *C. relictus*, Hgg. 1820.—Hgg. in Mg. Sys. Bes. ii. 69; *cæcutiens* var., Pandellé; *parallelogrammus*, Zell.; *nubilosus*, Harr.; *viduatus*, Mg.

The markings of this species are more irregular than those of *C. cæcutiens*, and it seems to be somewhat less common.

3. *C. quadratus*, Mg. 1820.—Mg. Sys. Bes. ii. 70 (♂); *pictus*, Mg.; *viduatus*, Mg.

Mr. Verrall first introduced this species to our fauna in the Ent. Mon. Mag. for 1886, January.

Professor Gobert thinks *fenestratus*, F., *Italicus*, Mg., and *perspicillaris*, Lw., only varieties of this species. Rather rare.

All the species of *Chrysops* are subject to very great variation, and all are very closely allied. Those taken in Britain come chiefly from the south coast.

V. Hæmatopota, Meig. 1803.

Mg. in Illiger's Magaz. ii. 267.

The species of this genus are very confusing; some authors (as Macquart) making several, whilst others (as Walker) admit only one. Most of the descriptions are so incomplete that it is impossible to tell to which species the types belonged.

Macquart, Gobert, Pandellé, and others have all created new species that many authors consider only varieties, and it appears to me that we can, at any rate for the present, only admit three to our fauna.

1. *H. pluvialis*, L. 1766.—Linn. Sys. Nat. ii. 1001; *equorum*, F.; *hyctomantis* ♂, Schi.; *Italica* (var.), Mg.

This species often occurs in such numbers as to make whole fields impassable, the bite being very severe, causing much inflammation. Very common.

2. *H. crassicornis*, Whlb., 1848.—Wied. Dip. Exot. i. 100; *ocellata*, Wied.; *pluvialis*, Walk.

This species is lighter in colour, the brown ring marks on the wings more circular, the abdominal spots more distinct than in *H. pluvialis*, and the hairs on the vertex of the head rusty brown instead of black. Not common.

3. *H. Italica*, Mg. 1804.—Mg. Klass. i. 163; *pluvialis*, Wlk.; *grandis*, Mcq.; *tenuicornis*, Mcq.; *triangularis*, Wied.; *elongata*, Curt.; *gymnonota*, Brullé.

Very rare. Two in the British Museum collection.

Were it not that space does not permit, I should have added analytical tables of the species and extended my notes on each species; but it is to be hoped that the list as here given may prove of some assistance to those working at this group.

I am now revising the British Asilidæ and Conopidæ, and should be most happy to receive any specimens for examination or notes on any species of either family.

129, *Grosvenor Park, Camberwell, S.E.*

SCIENCE-GOSSIP.

Professor von Fleischl, a German professor of physiology, has recently undergone an experiment wherein two-and-a-half inches of the sciatic nerve of a rabbit (dead but warm) was transplanted to his hand.

Mr. J. Ellard Gore, F.R.A.S., etc., has in the press a volume entitled "Planetary and Stellar Studies": papers on the planets, stars, and nebulæ. It will shortly be published by Messrs. Roper and Drowley.

Mr. A. R. Wormald's little brochure, entitled "The Practical Index of Photographic Exposure," has just passed into the second edition. We are not surprised, for it is one of the handiest little books out.

The planet Mars is just now obtaining much attention. A paper on it has just been read before the French Academy by M. Perrotin. He remarked that the region of Libya has recently undergone fresh modifications. The sea which covered the surface of this insular mass has mostly receded, its present appearance being intermediate between that of 1886 and its condition a few weeks ago. The existence has also been determined of canals or channels, partly double, running from near the equator to the neighbourhood of the north pole. They mainly follow the meridian, and merge in the seas encircling the white snow-cap of the pole, and, strange to say, their course may be followed across the seas themselves right up to the snow-cap.

M. Fizeau has also contributed a paper on the same subject. Speaking of the "canals" of Mars he says—"The various circumstances connected with these appearances, as lately described by Messrs. Perrotin and Schiaparelli, suggest a strong analogy with certain phenomena of glaciation—parallel ridges, crevasses, rectilinear fissures often of great length and at various angles, observed in the regions of

large glaciers in Switzerland and especially in Greenland. This leads to the hypothesis of a vast development of glaciation on the surface of Mars, where, the seasons being relatively longer and the temperature much lower, the conditions must also be more favourable than on the earth for these manifestations."

THE "Liverpool Mercury," speaking of Mr. Isaac Roberts' Pantograver, says:—"This is a simple engraving instrument, by Mr. Isaac Roberts, of Maghull, well known in the world of astronomy for his work in stellar photography. This machine is intended to transfer the star pictures on the glass negative direct to a copper plate, from which they can be printed without being retouched by hand. At first glance the instrument appears very complicated, but in operation it is really quite simple, and the results are astonishing. The engraving tool is a diamond, and the star circles can be either enlarged or reduced at will. By the aid of this pantograver, as Mr. Roberts calls it, a negative containing five hundred stars can be copied upon a metal plate by an average operator in one day, and the plate thus produced will be scientifically as accurate as the negative, and any number of copies can be produced by the printer for observations and measurements. The full significance of this invention will probably be realised only by those engaged in the work; but it is evident to all that reproducing stellar photographs by any means hitherto known to us introduces elements of uncertainty which render accurate work from copies almost impossible. By the application of the pantograver, it will be possible to produce at a very small cost an accurate star map of the heavens, and so the indefinite delay of an expensive catalogue scheme will now go to the wall."

THE opening of the Marine Biological Station, at Plymouth, on the 30th of June, was an event in the history both of our fisheries and of practical biology. We have never yet had in England or Wales any place where the scientific study of our fish fauna could be carried on, and having regard to the work that has been done in the United States, in Germany, and at Naples, we have fallen sadly behindhand. Scientific fish culture, properly so called, is quite unknown in this country. We have not even any reliable scientific observations on our fisheries and the migration of fish that can be relied upon. The success of the undertaking is greatly, if not chiefly, due to the unabated efforts of Prof. Ray Lankester.

THE British Association meets this year at Bath, on the 5th of September, under the genial presidency of Sir F. Bramwell, the great engineer.

THE Editor of SCIENCE-GOSSIP has now only a few nights open for lecture-engagements next winter. His list of engagements is limited, on account of other work, and this year it has been filled unusually early.

IN the "American Naturalist" for May appears an interesting paragraph, entitled "The Monkey as a Scientific Investigator."

THOSE who can, should read Dr. B. W. Richardson's lecture delivered before the Sanitary Institute on July 12th, upon "The Storage of Life."

AMONG the big things to be discussed at the forthcoming meeting of the British Association will be the Formation of Coral Reefs. Perhaps the Duke of Argyll will take part in it!

MICROSCOPY.

NEW SLIDES.—We notice with pleasure No. 22 of Mr. Fred Enock's slides and the accompanying "sketch." Both are devoted to that extraordinary insect *Nycteribia Hopei*—the parasite of the Indian flying fox. The slide is an unusually good mount. The insect is more like a spider than a fly, and if it had only two legs more, would be mistaken for one.

QUEKETT MICROSCOPICAL CLUB.—The last number of the journal of the above club contains the following papers: "Notes on Marine Aquaria," by H. J. Waddington; "On Arachnoidiscus as a Test for High-power Objectives," by T. F. Smith; "On some Remarkable Spicules from the Carnaru Deposit," by B. W. Priest; "On the Reproductive Organs, especially the Antheridia of some of the Florideæ," by T. H. Buffham; "On true and false Images in Microscopy," by T. F. Smith; "On the Interpretation of a Photo-micrographic Phenomenon," by the Abbé Diffraction Theory," by E. M. Nelson.

SCALES ON RED CURRANTS.—I do not know whether it is generally known (for I have not been able to find any mention of it in works on the microscope) that the red currant contains a very beautiful object for the polariscope. Most people have no doubt experienced the discomfort, after eating this fruit, of numerous flat scales adhering to the tongue or mouth, if these are scraped off the tongue and examined with the polariscope I think they will please. The colours are subdued and very beautiful; they will bear a ¼-inch objective. I believe these scales are situated in the crown of the fruit, but have not been able to discover their use or exact form, as they are very easily broken. I shall be glad of any information on the subject any of your numerous readers may be able to offer.—*Sidney J. Tindall.*

THE ROYAL MICROSCOPICAL SOCIETY.—The June number of the journal of the above society, besides the usual copious summary of current re-

searches relating to zoology and botany, contains the following papers:—"A Revision of the Genus Aulacodiscus, Ehrb.," by John Rattray; "The Foraminifera of the Red Chalk," by H. W. Burrows, C. Davies Sherborn, and the Rev. G. Bailey. The latter were obtained chiefly from Speeton, and are mostly of a large size.

ZOOLOGY.

SAND GROUSE.—Walking yesterday, about five o'clock P.M., on the road between Bexhill and Sidley, I noticed a flock of what I, at first sight, imagined to be nine pigeons. They, however, passed so close to me, just clearing the hedges, that I was able to identify them as sand grouse. I marked them down in a rough pasture some few fields from the road. I should be glad to learn if the sand grouse has been seen before in any part of Sussex, and if it has ever been known to breed in England?—*W. E. Windus, Bexhill-on-Sea.*

PALLAS'S SAND GROUSE.—With regard to the recent immigration of Pallas's sand grouse (*Syrhaptes paradoxus*) it may interest your readers to know that I saw on the 31st ultimo at Portsmouth a pair that were killed out of a party of about a dozen at Sinah Common, in Hayling Island, Hampshire, just over the Sussex border a few days before.—*William Jeffery.*

"ACHATINA OCTONA."—In reply to Mr. Long's query in the July number of SCIENCE-GOSSIP, I would refer him to Jeffrey's B. C. vol. i. p. 299, where mention is made of the introduction of this shell into the British list on the authority of Dr. Pulteney. It is a common West Indian land-shell belonging to the genus Stenogyra and was confused by Pulteney with *Limnæa glabra*, to which it bears a considerable resemblance. A near relative of this species (*Stenogyra Goodalli*, Miller) was accidentally introduced into some nursery gardens near Bristol about 1820, and is said to still flourish there, but I have never seen a record of *Stenogyra octona* under similar conditions. Some writers too have erroneously identified Linne's *Helix octona* with the English acicula, so that the introduction of this name may be traceable to several sources.—*Brockton Tomlin, Chester.*

UNRECORDED DAPHNIA.—In the February number of SCIENCE-GOSSIP (page 36) I gave a drawing of a Daphnia found at Rye House, which I believed to be unrecorded. I have now again found the same animal, in considerable numbers, in a different locality, namely Staines. I can confirm that each branch of the swimming antennæ has "five" plumose filaments, which is very abnormal, all other species of this genus having five to one, and only four to the other branch. It is viviparous, that is, the young remain in the brood-pouch until fully formed; I have seen them come out one by one, nine in all. The newly-born young resemble the mother very closely, having the long, single-jointed superior antennæ, and five, but very fine, filaments to each branch of the swimming antennæ, and two equally fine, but long posterior setæ. The excessive fineness of the filaments was remarkable, and quite out of proportion to the very stout branches of the antennæ to which they were attached. It soon became evident, however, that they were only temporary appendages. About five minutes after being born, every one of the young began to struggle violently, with the result that a fine skin was cast off, being the first moulting; the change was very striking, the filaments, which a moment before had been so fine that they could hardly be seen, were all at once quite large and in harmony with the rest of the body; the branches of the antennæ had become much thinner, and this leads me to believe that the filaments must have been bent and held against the branches under the tightly fitting skin, and on this being removed they were released and assumed their proper position. The head is rounded in front, and there is no pointed beak. I will name this water-flea provisionally *Daphnarella longisetata*, n. genus and sp.—*C. Rousselet.*

CAPTURE OF A SPIDER NEW TO GREAT BRITAIN.—On May 28th, I received a pair of Saltici from Colonel Le Grice, Royal Artillery, Shorncliffe, which I was unable to identify from the works by English authors, but on June 7th Colonel Le Grice informed me that Rev. O. P. Cambridge had identified this spider as *Pellenes tripunctatus*, or Crucigerus, described under both names by Walckenaer, but which had not been recorded as occurring in Grent Britain. This spider was first seen by Master Wm. Kerr (aged 11½), who pointed it out to Colonel Le Grice, who captured it. A female was seen soon after by Mr. Kerr, sen. and captured by Colonel Le Grice. Mr. Kerr informs me that this beautiful spider prefers the brightest sunshine, and occurs on sloping banks facing south, the male perching upon small pieces of chalk, and quickly jumping upon any unlucky fly which may come within range. The four large eyes on the anterior row are surrounded with bright scarlet hairs, below which a margin of white hairs contrast most strikingly with the black legs, &c. The female is totally different in colour, being covered with yellowish or almost white hairs; it is somewhat sluggish in its habits, until disturbed, when it jumps, first in one direction, then in another, making the capture of it really exciting and difficult. Both sexes are about of the same size as the common jumping spider (*Salticus scenicus*).—*Fred. Enock, F.E.S.*, 11 *Parolles Road, N.*

BRITISH ACHATINÆ.—Replying to Francis B. Long's query concerning this genus of land shells,

Catlow's remarks thereon are altogether wrong. *Achatina acicula* are not found at the roots of trees, but in the roots of grass and herbage. *Achatina octona—Helix octona* of Linné,—is a common West India shell, introduced by error into the British fauna many years ago. The *Helix octona* of Pennant is also an obsolete name and is now represented by our *Limnæa glabra*, an aquatic species found in streams and ditches. If Mr. Long is entering on the study of conchology I should strongly advise him to shun Catlow and adopt some more modern author.—*J. T. M., Sevenoaks, Torquay.*

THE DEVELOPMENT OF THE GNAT.—On p. 158, the Fig. 66 has been inverted. On p. 159, read "palpo," the fourth word of the seventh line, under "The Imago." Added note.—In specimens of the egg cases I examined this season (1888), I find that when not attached to the side of the tank they are suspended from any free floating object, and prevented sinking by this means. I am doubtful whether the thread always ends in a disk, and believe they are always suspended from some foreign body.—*H. T.*

BOTANY.

"MIMICRY" IN PLANTS.—I enclose herewith a specimen of *Geranium molle* with white petals. It was found growing by a sandy roadside near Blyton, Lincolnshire, among a great profusion of *Cerastium arvense* from which the flowers were scarce distinguishable. It might almost be classed as a case of mimicry were it not for the difficulty in seeing what protection a resemblance to *Cerastium arvense* could afford it. It is, I think, more probably a case of reversion due partly to the dry nature of the soil, and partly to its exhaustion by the large quantity of Cerastium growing closely around. This is rendered more probable by the fact of the specimen being below the average size.—*G. A. Grierson.*

DRYING PLANTS.—I cannot recommend sulphurous acid and methylated spirits for steeping flowers in. I tried it, and green leaves turned a dull brown; blue and purple flowers, such as *Centaurea cyanus*, *Phacelia tanacetifolia*, *Ajuga reptans*, *Eutoca viscida*, and *Myosotis dissitiflora* turned pink and crimson, and *Aconitum napellus* partly pink and brown. Red and pink flowers were much changed in shade; the last disastrous effect was on white and yellow flowers, as Doronicum, Pyrethrum, *Bellis perennis*, *Hieracium aurantiacum*, &c.; but their foliage was spoilt; this effect was apparent after very few hours' immersion. In a spike of *Cynosurus cristatus* the glumes turned brown and the anthers pink. Can any chemical reader explain why so many turned pink?—*E. A.*

YEW TREES OF KINGLEY VALE.—In the beautiful and secluded spot of ground called Kingley Vale or locally Kingley Bottom, which is equally divided between West Stoke and Lavant near Chichester, there is an assemblage of yews such as is rarely to be met with. They number considerably over two hundred. Tradition assigns to a part of this grove a date of about A.D. 900. In the centre of this is a solitary oak, said to be connected with Druidic rites; this is now a mere shell, but has one branch still luxuriant and overtopping all the adjacent yews, its foliage appearing in bright contrast. Its girth I find must have been when the tree was perfect about 18 ft. That of the larger yews of the grove was about 20 ft. at 4 ft. from the ground. Their circumferences are less than those of other yews growing in Sussex churchyards, but the point which chiefly strikes the observer is their great number, and I should be much obliged if readers of SCIENCE-GOSSIP would inform me of any locality in which hundreds of yew-trees are to be seen growing together, and whether, if so, they have the appearance of being indigenous?—*F. H. Arnold.*

THE BOREAL FLORA IN COLORADO.—Among my finds in Custer Co. this year are several species common also to Britain, and belonging to the Boreal Flora. Yesterday I came across a patch of *Geum rivale*, Linn., and this is a more southern locality than any so far recorded for it in America. *Equisetum hiemale* and *E. arvense* are very commom here, and among the lower Cryptogamia I have met with *Agaricus campestris*, Linn., *Ustilago segetum*, Bull. (on oats), *Ceratodon purpureus*, Brid. (which in England I used to find on Chislehurst Common), *Distichium capillaceum*, B. and S., and *Closterium acerosum*. But these cryptogamic plants are so widely distributed that one cannot draw many conclusions from their occurrence in any given region. *Marchantia polymorpha* is also very abundant by the creeks in this locality, and recently I found *Lemna trisulca* and *L. minor* close to West Cliff.—*T. D. A. Cockerell, West Cliff, Colorado.*

UNUSUAL GERMINATION.—Last year I frequently met with cases of abnormal germination, similar to that mentioned in the July number of SCIENCE-GOSSIP, with these differences: that my experience was with lemons, and the growth of the young plant had not proceeded quite so far as that shown in the diagram of last month. Taken in connection with the usually accepted teaching that air is necessary for the germination of seeds, and light for the production of chlorophyl, these abnormal germinations are very singular.—*F. J. George, Chorley, Lanc.*

CORRECTIONS TO NOTES ON EIGHTH EDITION OF LONDON CATALOGUE, BY ARTHUR BENNETT.—There are some needed corrections which ought to be made, and had escaped my notice until kindly friends pointed them out.

172. It is very doubtful whether the name *stagnina* ought not to have been retained.

343*b* alter to *c*.

936 of 8th ed. is 1059 of 7th ed. *not* 1060, which is 937 8th ed.

1144 8th ed. is 985 7th ed., *not* 986

1145 8th ed. is 986 7th ed.

1166 "p," the p is wanting.

1463 p. 110 should be 1493

1511 Mr. Beelys calls my attention to this, that the character I have assigned to this belongs to *L. macrostemon*, Gay, which is very rare in Britain.

1562 Schrank, not Schreb.

Unusual Germination.—I see in the July part of your paper an account of an "Unusual Case of Germination." I have frequently seen the seeds of lemons sprouting *inside* the lemon, although never so much so as to produce leaves as in the above account. —*Prosper H. Marsden.*

The Botany Examination of the Science and Art Department, South Kensington.—Can any of the readers of Science-Gossip inform me what school of botany it is necessary to attach oneself to, or what books it is necessary to read in order to pass the Honours stage of the examination in Botany under the South Kensington Science and Art Department? I know a few thoroughly competent botanists of many years standing who have repeatedly sought to pass that test and been rejected. The examiners, I am aware, insist upon a sound knowledge of Physiology; but one of my friends, who went in last May, carefully studied Vines's and Sachs's works on the subject, besides going through a considerable training in experimental and microscopic work, and has just received an intimation that he has not done sufficiently well to make it necessary for him to attend the practical part of the examination at South Kensington. He is considerably puzzled to know where the weakness in his paper lies, for he felt thoroughly at home in the questions, and could have easily answered all that were set, but of course he was confined to a limited number. Is it true that the examiners require a candidate to have passed all the previous stages before they will grant a pass in Honours? or that the examiners favour lady candidates more than gentlemen? Or that the amount of money at disposal for grants or passes is limited, and that the number of passes is regulated accordingly? Or that some subjects are favoured by the Department more than others? Is it also a fact that the form which is filled up by the candidate does not go before the examiners? Why should it be so particularly insisted upon that the candidate's previous highest success should be stated in this form? What have such matters as the age and profession of the candidate to do with the examination? Are not these examinations intended to encourage the study of science among the working-classes rather than among persons who have received a special university training? These are a few of the questions that I should like to see answered, and unless they are answered the present increasing want of public confidence in the honesty of the Department will go on until the whole scheme becomes a farce and a failure. Perhaps a question in the House of Commons would settle the matter.—*Inquirer.*

NOTES AND QUERIES.

A Starling in Trouble.—A labourer hearing an unusual noise proceeding from the roof of an outhouse, observed that a starling had caught its leg between two tiles and was endeavouring to get free, at the same time screeching as loudly as possible apparently from fear and pain. He thinking that the starling being unable to extricate itself would starve, went in search of a pole in order to put it out of its sufferings. But another starling hearing the screeches of its companion came to the rescue, and commenced tugging and pulling at the refractory leg, which by the combined efforts of the two was soon released uninjured.—*Edward Goodwin.*

Flies in Windows.—Can any of your readers explain how it is that when a fly buzzes on the window-pane it turns its back to the glass? As far as I can see it is done solely for enjoyment, and that the fly could not get up such a fine sensation by having its feet towards the smooth surface. Secondly, do flies turn their backs to the surfaces of leaves, trees, stones, rocks, &c., and enjoy their buzz against them, or is this an acquired habit of theirs since the discovery of glass?—*J. Smith, Monkredding Kilwinning.*

Answer to Query at p. 100.—Tremella is a fungus. There are several species, and in all of them the whole plant is gelatinous, and more or less folded. Most of them have the faculty of absorbing and holding water almost like a sponge. They shrink into small compass in dry weather, but quickly swell out again under the influence of the first shower. One species (*Tremella mesenterica*) is known in many places as witches' butter, and is often common on dead branches.—*H. W. Lett, M.A.*

Several Natural History Queries.—Can any of your readers inform me: (1) If they have ever seen a toad in the stomach of a fish, and if so, will they kindly mention what fish? (2) Have they ever seen a frog clinging to the head of any fish, as so minutely described by Walton; if so, did the fish suffer in any way? (3) When pike have paired off in the spring, have they ever seen three, or say a brace, so close together, (i.e. side by side) that it would have been possible to snare them at one go? Say two weighing 3 lbs. each. Can any of your readers give any reason for jack indulging in this habit before spawning? Do perch, for instance, carry on in this manner? I merely ask the question, because on one occasion I caught nearly forty perch and there were only three males in the lot. Female bream are often attended by three or four males. A female toad again is often followed by, I should be sorry to say how many males. Lastly, when frogs and toads have coupled, can any of your readers inform me when impregnation takes place? Is it before, after, or at the time of shedding the spawn? Can you give me any reliable information?—*M. A.*

Stoats and Weasels for Australia.—A syndicate of capitalists has for some time past been purchasing large numbers of stoats and weasels for exportation to Australia and New Zealand for the purpose of reducing or destroying the rabbits which have become such a pest to the farmers in these countries. A gamekeeper in the neighbourhood of Brampton, Cumberland, was appointed their agent, and he has already secured and transmitted about four hundred of these vermin to the antipodes. The price he pays to the trappers is from 5*s.* 6*d.* to 7*s.* 6*d.* each, but by the time they reach their destination it has been increased to six or seven pounds each. They are packed in boxes two in each, and fed during the voyage on dead pigeons, two of the latter being supplied to each of the animals once in three days. They require great care and attention during the voyage out, and this added to the expense of feeding raises their value to a considerable amount on their arrival at the destination. A singular change has come over the habit of the rabbit since it became acclimatised in Australia. Here it burrows in the ground, but in that country it is in the habit of climbing trees, which it can do with great facility, for the purpose of feeding on the leaves and bark, of which it seems particularly fond.—*Dipton Burn.*

Observation on Young Cuckoos.—On Wednesday, June 27th, I was shown a fully-fledged cuckoo sitting in (or, rather, all over) a robin's nest in the bank of a lane. My uncle, the Rev. N. A. Watson, of Boughton, Malherbe, who found the nest, told me that after hatching the egg, the robin parents deserted the nest, and that the cuckoo parents (both) took charge of their offspring, and that he had often seen them feeding it. He was quite sure that the robins would have nothing to do with the interloper. Is not this a variation on the traditional account?—*M. S. Pope, Maidstone.*

Nest of Short-tailed Field-vole.—A friend of mine the other day brought me word, that whilst egg-collecting in a wood, he had found a nest of young mice in a hole in a tree. He thought it was a great tit's nest, and was rather surprised when he secured three young mice in his net, instead of eggs. I visited the tree a few days afterwards, and found that the hole by which the old mouse entered was very small, and situated about twelve inches from the ground. There were five young voles in the nest, all of which I secured, but the old one escaped. What surprised me most was the quantity of material comprising the nest; it would have taken a half-gallon tin to have held it all, and was composed of moss, gnawed up into fine pieces. I always understood that the field-vole made its nest on the ground in fields, &c. Is not this an unusual place for one? *C. D. Head, Norwood Street, Scarborough.*

Influence of Sound on Animals.—The following incident having come under my own personal observation, I append it, as it may be of interest to readers of Science-Gossip, more particularly to those who are interested in the influence of sound upon animals. That "music hath charms" no one will deny, but how far that fascinating charm exerts itself is difficult to determine. Life in the country gives the possessor of a "quiet eye" much opportunity for observation. The drawing-room of our rustic dwelling opened on to a lawn; immediately outside the glass door was a large flagstone making, as it were, a step from the room to the garden. Our delight on a summer's evening was to sit outside, whilst one of the others indoors would entertain us with pianoforte music, and it appeared not only us but also a visitor which we invariably received on those occasions. No sooner had the music begun than a large toad came jumping along over the gravel-path, across the lawn, and taking up his position on the flagstone, would remain as long as the music continued, neither fearing nor taking the slightest notice of our presence; there he stayed, apparently happy and certainly as much delighted as we. As soon as the piano ceased our friend bade us "good night" and jumped away home. I am pleased to add we were continually honoured by his company. Query. Is this a peculiar case, or one of frequent occurrence?—*Arthur B. Harrison, Chelmsford.*

Varnishing Photo Gelatine.—*Dry Plates.*—White hard varnish diluted with methylated spirit, in the proportion of fifteen parts varnish to twenty-five parts spirit, makes a fair dry plate varnish. It is not very durable and apt to be soft. Some recommend the addition of a little "brown hard" to it in order to remedy this defect.—*B. Sc., Plymouth.*

Toads Spawning.—A correspondent, writing under the head "Toad Spawning," asks if it be a fact that toads croak. The question is made curious by your correspondent stating that he has always studied the habits of the toad. Perhaps he will pardon me if I hint that he could not have very closely studied the habits of that animal, even for a short time, without having heard, at least at breeding time, a full chorus. Since writing the last line I have been to my froggery, or more strictly "toadery," and succeeded in making one of my toads croak by putting it first in water and then pretending to catch it. Perhaps your correspondent will verify experiment for himself.—*R. T. T., Gosport.*

Rudiments.—As a contribution to this discussion, I may mention that Sachs, in his "Vegetable Physiology," used the terms "rudimentary" and "reduced," the former in Miss Layard's sense, and the latter in the sense in which Mr. Darwin used the word "rudimentary." Sachs classifies all organs into typical, metamorphosed, rudimentary, and reduced, on physiological grounds.—*J. Hamson, Bedford.*

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.

A. Mayfield.—Yes, you are right; the plant is *Claytonia perfoliata.*

C. J. Heaton.—The yellow-flowered composite plant you sent is the leopard's bane (*Doronicum pardalianches*).

J. I. N.—Mr. Arthur Bennett's address is 107 High Street, Croydon.

J. S. G.—We shall be very glad to have your papers on the Molluscan Fauna of Malta. It is a place much visited now.

C. H. G.—Thanks for the specimen; it is a fungus—*Xylaria digitata.*

B. Sc.—The "Journal of the Royal Microscopical Society" may be obtained of the publishers, Messrs. Williams and Norgate, London; or of Mr. W. P. Collins, 157 Great Portland Street, W.

EXCHANGES.

INDIAN birds' skins in exchange for micro mounts or requisites, scorpions, centipedes, &c., in spirit for dissection, &c. Any objects of natural history collected for exchange. Correspondence invited.—R. de H. St. Stephens, A.R.S.M., the Eastern Mysore Gold Company, Limited, Kolar Road, Province of Mysore, Central India.

OFFERED.—*Acilius sulcatus* and larvæ, and *Limnea stagnalis*. Wanted.—Hydrophilus and *Planorbis corneus*, for aquarium.—Thomas D. Sellers, Deepdale, Davenport Park, Stockport.

WANTED, many species of birds' eggs, particularly clutches with data. Offered, British lepidoptera.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

DUPLICATES, *Unio margaritifer* (L.), from the only Lancashire locality, and other good shells. Desiderata, British and foreign land and freshwater shells.—W. Hy. Heathcote, M.C.S., East View, Preston.

DRAGONFLIES wanted from all parts of the British Isles, fresh and unset preferred. Offered, lepidoptera, *A. adippe, A. euphrosyne, A. selene, A. paphia, G. rhamni, L. sinapis, T. rubi*, &c.—W. Harcourt Bath, Birmingham.

DRAGONFLIES wanted from all parts of the world. Offered, land and freshwater shells, arachnida, collection of grasses, natural history books, &c.—W. Harcourt Bath, Ladywood, Birmingham.

DUPLICATES.—*Planorbis glaber, Planorbis nitidus, Cochlicopa tridens, Physa hypnorum, Zonites crystallinus*, and others. Wanted, *Bulimus montanus, Pisidium roseum, Ancylus lacustris, Physa fontinalis*, and others not in collection.—John Clegg, Sandholme Villas, Todmorden.

SMALL collection of birds' eggs, some side-blown; also Kearley's "Wonders and Curiosities of Animal Life," cloth, gilt. What offers in foreign stamps?—H. Langford, 4 Gill Street, Nottingham.

To Egg Collectors.—Have several rare Rüppell's and sooty tern's eggs to exchange for clutches of British birds' eggs; must be side-blown, one-hole, and full data.—Commander Young, R.N., Rodwell, Weymouth.

WANTED, European or foreign coleoptera, in exchange for S. African lepidoptera, coleoptera, or hymenoptera.—R. M. L., c.o. T. D. Butler, Esq., Duke's Road, Rondebosch, near Capetown, S. Africa.

BRITISH mosses, about 120 varieties, in exchange for scientific books or apparatus.—G. A. Barker, 1 Northwold Road, Upper Clapton, E.

EGGS.—Kingfisher, cuckoo, buzzard, nightjar, twite, heron, ring ouzel, dipper, goldfinch, &c., all one-hole, this season's eggs, in exchange for others.—Jas. Ellison, Steeton, Leeds.

WANTED, eggs of tits, shrikes, hawks, warblers, buntings, plovers, finches, grebes, &c., in exchange for other rare eggs, in sets or separate.—Jas. Ellison, Steeton, Leeds.

COLLINS'S histological microscope in mahogany case, with a 1-inch objective by Beck, all quite new and in splendid condition, no further use for it. What offers?—E. Wagstaff, 3 Waterworks Road, Edgbaston, Birmingham.

WANTED, to exchange British for North or South American plants. I have a large number of species which are not native in America. Printed list sent on receipt of address.—H. Fisher, 26 Stodman Street, Newark, Notts.

BIRDS' eggs, side-blown, wanted, in exchange for lepidoptera. Have elpenor, fuciformis, stellatarum, atropos, convolvuli, ocellata, bucephalus, nupta, dominula, plantaginis, pinastri, ligniperda, ligustri, monacha, aprilina, butes, and others, and many butterflies.—Wheldon, chemist, York.

OFFERED.—L. C., 8th ed.: 5, 13, 34, 40, 43, 45, 65, 76*c*, 94, 95, 96, 98, 121, 149, 164, 168, 191, 309, 352, 526, 557, 559, 590, 656, 741, 754, 776, 777, 979, 1102, 1104, 1237, 1240, 1361, 1363, 1385, 1386, 1389, 1475, 1545, 1592, 1595, 1606, 1609, 1616, 1654, 1657*b*, 1694, 1719, 1724, &c. Many desiderata, especially hieracia.—Miss E. Armitage, Dadnor, Ross, Herefordshire.

I SHOULD like to correspond with some one, in any part of the world, who is forming a collection of British and foreign birds' eggs (side-blown preferred), with a view to exchange specimens.—H. B. Booth, 25 Northfield Place, Manningham, Bradford, Yorkshire.

DUPLICATE, *Unio margaritifer*. Wanted, American unios.—W. Hy. Heathcote, M.C.S., East View, Preston.

P. dilatatus and *arbustorum, C. tridens, Bul. obscurus*, and others, in exchange for other British land and freshwater or marine specimens.—W. Dean, 50 Canning Street, Stoneyholme, Burnley, Lancashire.

EXOTIC butterflies.—*Papilio ulysses*, ♀, *Buddha*, ♂ and ♀, *Homerus, Morpho adonis*, and other rarities, fair condition; also wings of morphos and urani, as for microscope. Wanted, *Papilio ascanius*, ♂, *montrouzieri*, &c.—Hudson, Railway Terrace, Cross Lane, Manchester.

WANTED, Scotch copper coins and gun money, in exchange for British copper coins. *Acherontia atropos*, &c.—W. P. H., 26 Market Place, Newark.

OFFERED.—L. C., 8th ed.: Nos. 137, 257, 300, 337, 342, 415, 547, 590, 636, 651, 899, 960, 1171, 1367, 1393, 1417, 1521, 1540, 1560, 1571, 1582, 1596, 1617, 1620, 1623. Many desiderata.—W. A. Clarke, The Grove, Chippenham, Wilts.

OOLOGICAL specimens wanted; conchological specimens will be given in exchange.—Jos. S. Galizia, M.C.S., 64 Piazza Celsi, Valletta, Malta.

WANTED, complete back volumes of SCIENCE-GOSSIP and "Journal of Conchology," also scientific books; Maltese land and sea shells given in exchange.—Jos. S. Galizia, M.C.S., 64 Piazza Celsi, Valletta, Malta.

WANTED, examples of the algæ, seaweeds of all kinds, growing on the Welsh coast of the Bristol Channel; foreign algæ or other plants in return.—I. Gifford, Parks, Minehead, Somerset.

OFFERED.—Thirty-one Nos. SCIENCE-GOSSIP, 1885–6; thirty-one Nos. "Naturalist's World," 1884–6; twelve Nos. "Practical Naturalist," 1883.—E. J. Dufty, Luxford, Notts.

WHAT offers for mounted or unmounted sections of various organs of frog (most of them injected); also vegetable sections (fern, bean, &c.)? Wanted.—Frogs and other organisms required for Huxley's biological course; also micro apparatus.—Richard Ferdinand Tomlins, 82 High Street, Gosport.

Cyclostoma elegans, Helix virgata, Bythinia tentaculata, and several other varieties of land, freshwater and marine shells, in exchange for other varieties. Lists.—F. Stanley, M.C.S., Clifton Gardens, Margate.

WOULD be glad to correspond with persons interested in the smaller marine life, with a view to exchange the same for that of freshwater, vegetable or animal, microscopic or otherwise, most suitable for mounting, or aquarium purposes.—Jos. I. Newton, 202 Blandford Street West, Ashton-under-Lyne, Lancashire.

WANTED, specimens of less common British birds (skins or in flesh). Offered, five vols. of SCIENCE-GOSSIP (1865–9), and other natural history books; also some foreign bird skins.—J. H. K., 18 Church Street, Commercial Street, London, E.

I SHOULD be glad if any reader of SCIENCE-GOSSIP could let me have a few live crayfish (*Astacus fluviatilis*).—Chas. A. Whatmore, Much Marcle, Gloster.

WANTED, a student's microscope. Send particulars to—Chas. A. Whatmore, Much Marcle, Gloster.

DANA'S "Text-Book of Mineralogy" (4th ed., 1882), for Geikie's large "Geology;" Sir G. Head's "Tour of Many Days in Rome" (3 vols.), and Dalbono's "Roma Antica e Moderna," for botanical literature; Sir W. Jardine's "Strickland's Memoirs and Scientific Writings," for geological or zoological literature.—Rich. McCully, Winchester Road, Romsey, Hants.

MALTESE, and some foreign land and sea shells in exchange for a good secondhand microscope.—Jos. S. Galizia, M.C.S., 64 Piazza Celsi, Valletta, Malta.

BOOKS, ETC., RECEIVED.

"Geology for All," by J. L. Lobley (London: Roper and Drowley).—"Flower Gardening for Amateurs," by Lewis Castle (London: Swan Sonnenschein & Co.).—"Flora of the N. East of Ireland," by Messrs. Stewart & Corry (Cambridge: Macmillan).—"Handy Guide to Norway," by T. B. Wilson, M.A. (2nd ed., London: Stanford).—"Bird's Nesting and Bird Skinning," by Miller Christy (London: T. F. Unwin).—"Speaking Parrots," by Dr. K. Russ, parts 1 and 2 (London: T. F. Unwin).—"Trans. Chichester Nat. Hist. Soc."—"Illustrated Manual of British Birds," by Howard Saunders, Parts iii. and iv. (London: Gurney & Jackson).—"Trans. Leeds Geological Association."—"Synopsis of the Vertebrate Fossils of the English Chalk," by A. G. Woodward.—"Journal of Trenton Nat. Hist. Soc."—"Westmoreland Note Book and Nat. Hist. Record."—"Proceedings Yorkshire Geol. and Polytechnic Soc."—"Electricity versus Gas," by John Stent (London: Swan Sonnenschein & Co.).—"The Essex Naturalist."—"Journal of Microscopy and Nat. Science."—"The Sanitarian" (New York).—"Book Chat."—"Belgravia."—"The Gentleman's Magazine."—"The Naturalist."—"The Ottawa Naturalist."—"The American Naturalist."—"The Victoria Naturalist."—"The Midland Naturalist."—"The Amateur Photographer."—"Science News" (weekly).—"Proc. Royal Soc. of New South Wales."—"The Botanical Gazette" (Crawfords & Wille, Indiana).—"The Garner."—"Feuilles des Jeunes Naturalistes," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: Dr. J. W. W.—J. G.—J. H.—R. M. L.—W.—H. G.—I. D. S.—Rev. C. J. S. B.—J. L.—W. K. M.—J. R.—W. H. B.—W. A.—A. R. W.—E. B.—H. J. B.—G. W. B.—W. H. G.—J. W. J.—I. D. A. C.—F. H. W.—E. W.—G. D. T. R.—R. C.—C. P.—J. A. W.—G. A. B.—A. M.—W. H. G.—A. B.—C. D. H.—J. E. G.—A. L. D.—J. L.—E. B.—R. H. B. N.—F. H. A.—W. H. L.—W. H. H.—B. T.—W. H. B.—C. Y. R. N.—J. C. M. C. S.—D. B.—C. R.—N. A. L.—J. E.—G. A. G.—E. A.—M. E. P.—A. G. H.—F. J. G.—W. P.—R. L.—A. J. W.—H. F.—C. J. H.—Dr. A. B. G.—C. R.—A. D.—H. B. B.—W. P. H.—C. C.—Wm. A. C.—H.—W. H. H.—S. J. L.—J. F. H.—E. E. L.—R. McC.—J. H. K.—T. B., jun.—A. H. S.—F. S. T.—J. I. N.—R. T. T.—P. H. M.—J. L. M.—J. H. G.—E. J. D.—G. A. C.—C. A. W., &c. &c.

THE SUNFLOWER.

By H. W. LETT, M.A.

THE Helianthus or sunflower (the English is a literal translation of the botanical name), of which there are thirty-five known species, is a native of America, from whence it was first brought to Europe in the year 1597. Owing to the recent fashion in favour of this showy flower, it is familiar to everybody, but it is not so well known that the common garden vegetable, the Jerusalem artichoke (*Helianthus tuberosus*) is one of the same genus. The name "Jerusalem" is probably a corruption of the Italian "girasole" or "turn-sun," *i.e.*, sunflower; while the usurped title "artichoke" (to which it has botanically speaking no right whatever) has reference to the flavour of the tubers. Few persons in this country have ever seen the flower of the Jerusalem artichoke, which is seldom produced in the British Isles, indeed it is not worth the trouble needed to bring it to perfection, being a small yellow blossom like that of the coltsfoot enlarged.

The sunflower is largely grown in parts of France for its seeds, which yield large quantities of oil and oil-cake used for cattle food, and in certain regions of America it is cultivated for the stems, which supply sufficient fuel for cooking.

The old Greeks and Romans had quite another plant which they called Heliotropium or Heliotrope—literally "Sunturning"—to which they attributed many extraordinary and fabulous properties, amongst others that described in its name of always turning its open flowers to the sun; this by some is considered to be the common *Heliotropium Europæum* of South Europe, which is not much more than an insignificant weed. The modern sweet-scented Peruvian Heliotrope, or "Cherrypie," was not introduced from South America till 1740, having been discovered by the celebrated Jussieu when botanizing among the Cordilleras.

There is a wonderful jumble and confusion in the minds of many about and between these two plants Helianthus and Heliotropium. What the ancients believed concerning their Heliotrope has been transferred without any reason (except that the first part of each name is the same) to the Helianthus, a name given by the great Linnæus, on account of the brilliant colour of the flowers, and their resembling the typical representations of the sun—an orb surrounded by a circle of tongues of flame. And the idea thus associated with the plant, notwithstanding its being disowned by such an authority as Sir Joseph Paxton in his "Botanical Dictionary," is still taught by our popular dictionaries, just as the poet sings "how the sunflower turns on her god when he sets the same look that she turned when he rose!"

I thought the notion had passed away from the minds of modern botanists as a poet's fancy, till I lately read in the "Journal of Microscopy and Natural Science" for July 1886, an interesting paper by Mr. H. W. S. Worsley-Bennison, F.L.S., Lecturer on Botany at Westminster Hospital, on "The Power of Movement in Plants," in which at p. 157 occurs the following passage—"Positive Heliotropism, ... Among flowers, the compositæ furnish us with many examples, one being specially prominent, the sunflower, whose peduncle twists in a circle during the day, bringing its flower constantly *towards the sun*."

When I perused this statement in print by such a writer, though I was quite sceptical of any such extraordinary Heliotropism, I resolved to test it practically, and having done so I now send you the result.

A long row of fine sunflowers in an open space, apart from walls or trees, in my garden, afforded a most favourable opportunity; and amongst them I

selected six of the finest blossoms. These faced by a compass, respectively, north, south, east, west, north-east, and south-east. Having driven a stake into the ground close before each selected flower, I nailed on each stake two pieces of wood each eight inches in length and one in width ; one of these was on the top of each stake and could be moved by me in a horizontal direction, the other I placed a little lower on the side of the stake at right angles to the first. It is not easy, without a figure, to explain my simple and yet complete contrivance for observing if the sunflowers moved in any direction.

I set my indices, by fixing each pair of pointers perfectly parallel to the discs of the flowers, so that no matter in what direction the flower might move, it must be apparent when next inspected. I visited them three times each day for a week, shortly after sunrise, at noon, and a few minutes past sunset. The time was the first week in September of the year (1886) ; and the flowers were just beginning to open the florets on the circumference of the discs.

Well—I found no twisting of the peduncle in a circle, no turning of the flower after the sun—none whatever. My flowers faced, respectively, north, south, east, west, north-east, and south-east, as they did when I set my marks at them. So far as facing towards the sun, there was no movement that I could detect. One slight alteration I did notice in some but not all of the flowers with which I was experimenting, a tendency of the head to droop or incline towards the earth, as the seeds began to form ; what I call my vertical indication showed this, but there was no return to the original position, the inclination remained permanent. Moreover, this insignificant movement was not towards, but actually away from the sun, and appeared a provision for keeping the crowded seeds dry as they rapidly formed and began to ripen.

If it were the case that the sunflower every twenty-four hours twisted its peduncle and brought its flower constantly towards the sun, every sunflower in every garden would be found facing in precisely the same direction, a fallacy needing no refutation. Why, I have grown sunflowers against a south wall, and they faced in all directions (just as those in my garden are doing now while I write) some even towards the wall !

It was said to me, at the time I was recording these observations, that the sunflowers only turned towards the sun when the sun shone ; very good, and five out of the seven days of my trial were genuine sunshiny days, and still I could not detect any difference at any time in the position of the flowers.

Just one more fact, the sunflowers were of the common tall and dwarf kinds ; the seed from which they were raised was partly home-saved, and partly bought at a seedsman's in Belfast, and the flowers when expanded seemed just the same as those with which I have been familiar for forty years.

Aghaderg Glebe, Loughbricklana, co. Down.

NOTES ON NEW BOOKS.

THE STORY OF THE NATIONS—ASSYRIA, by Z. A. Ragosin (London : Fisher Unwin). This is one of the most interesting volumes of this interesting series. It reads more like a lively novel than dry ancient history, and the numerous illustrations help the reader marvellously.

The Flora of the north-east of Ireland, by S. A. Stewart, and the late J. H. Corry (Cambridge : Macmillan). County and local floras are rapidly multiplying, and it is a good thing that our British plants should be thus accurately chronicled. The present work gives a thoroughly trustworthy account of the native flora of Down, Antrim, and Derry. The idea was projected by Mr. Corry many years ago, and has been ably carried to its completion by Mr. Stewart. Indeed, Mr. Corry, at the youthful age of twenty-four, may be said to have lost his life in connection with this book—for he was drowned in Lough Gill when on a botanical expedition.

Nature's Fairy-Land, by H. W. G. Worsley-Benison (London : Eliot Stock). A series of delightfully-written chapters, recalling rambles by woodland, meadow, stream, and shore. Mr. Worsley-Benison is a well-known writer in our columns, and therefore our readers are aware he is an enthusiastic naturalist. The chapters in the book have been mostly contributed to various magazines. We cordially commend Mr. Benison's book to our readers.

Bird's-nesting and Bird-skinning, by Miller Christy (London : T. Fisher Unwin). This handy little volume is just the book for a beginner. It was originally written by the late Ed. Newman ; but the present is the second edition, thoroughly revised and rewritten by Mr. Christy, and the chapter on bird-skinning is wholly his own.

Geology for All, by J. Logan Lobley (London : Roper and Drowley). Mr. Lobley is widely known as an earnest geologist. Few other men have been so much mixed up with geological literature. As a lecturer and teacher he has also been most successful. Consequently our readers will be prepared to expect that this little manual is one of the highest character. A young man desirous of taking up geology as a study cannot do better than buy this book.

Flower-Gardening for Amateurs, by Lewis Castle (London : Swan Sonnenschein). Books on gardening are always welcome, but there is an especial charm about Mr. Castle's. The author is as well up in horticultural literature as he is practically acquainted with the subject. Amateurs who are their own gardeners will gratefully peruse this little volume, and find hosts of hints they can carry out for themselves.

The Smithsonian Report for 1885 is a bulky volume, full of illustrations. Nearly the entire work is taken up with a description of the George Catlin Indian

Gallery, by Thomas Donaldson. To ethnologists this volume has therefore an unusual value.

Handy Guide to Norway, Second ed., by Thomas B. Willson (London: Ed. Stanford). Mr. Willson's excellent guide to a now much visited country has been thoroughly revised and enlarged. It may be too late to visit Norway this year, but those who think of going next summer should obtain this handy book. It is abundantly illustrated with maps, and the notes on botany and fishing, &c., make it unusually valuable.

My Microscope, by a Quekett Club Man (London: Roper and Drowley). A charmingly-written and artistic little book, designed to be an "Introduction to the study of the Infinitely Little." This is the second edition, showing how well the first was appreciated by the rapidity with which it has gone off.

British Reptiles, by C. C. Hopley (London: Swan Sonnenschein). This is another shilling volume of "The Young Collector" series, whose chief value consists in each having been entrusted to the person best fitted to write it. Nobody will doubt Miss Hopley's fitness — this little book includes the Batrachians.

The Transactions of the Leeds Geological Association, Part 3, contains some excellent papers by Mr. Thomas Tate, Professor McAll, W. Cheetham, C. Brownridge, Professor Green, &c., and some well-written accounts of geological excursions made in the district.

Transactions Chichester and West Sussex Natural History Society, has papers by the Rev. C. D. Ash, Rev. F. H. Arnold ("Phyto-Geography of the South Coast"), Rev. J. Fraser, Dr. Paxton, and Mr. Joseph Anderson, jun.

The Westmoreland Note-Book and Natural History Record, is devoted to local topography, biography and antiquarianisms; it also contains local ornithological, botanical, and geological papers.

Transactions Hertfordshire Natural History Society, vol. iv. part 8, is devoted to accounts of various field meetings, held in different parts of the county.

The eleventh annual report of the *Hackney Microscopical and Natural History Society*, contains abstracts of papers read, and shows the Society to be in a very healthy state.

ROSE PESTS.

Hemiptera.

SOME conversation upon certain rose insects, which took place at a recent meeting of gardeners, has induced me to refer to the subject in these pages, in the hope that the matter I have to bring forward may be useful to the large number of persons who peruse these pages, many of whom, no doubt, are more or less interested in the cultivation of these beautiful flowers.

Perhaps the worst insect enemies of the rose are the various species of aphides, green fly, or smother flies, as they are variously called. G. B. Buckton, F.R.S., in his excellent monograph published by the Ray Society, gives five species as infesting various species or varieties of rose. The most common of these are *Siphonophora rosæ* and *S. rosarum*, but for all practical purposes they may all be treated as one species. No gardener needs be told of their hurtful properties, clustering round the buds and tender branches, and sucking the juices of the plant by inserting the rostrum through the tender bark. The rate of increase of these insects is something prodigious, and unless a check is put upon them as soon as they appear in the spring, they soon become so numerous as to render any remedial measures almost hopeless. In common with other aphides, the rose aphis has several natural enemies, and these at all times should be encouraged. The most observable, perhaps, being the various kinds of hovering flies (Syrphidæ), those two-winged insects with bodies banded black and yellow, and which may be seen in sunny weather flying about the garden and poising motionless every now and then before some object, especially a composite flower, but darting off with lightning speed, if disturbed, to poise again in another place. These deposit eggs among the aphides, and the grubs which hatch from them are legless, broad behind and tapering gradually to the head. They feed upon the green flies, as do also the various kinds of lady-bird beetles (Coccinellidæ) and their larvæ. In the case of a tree which grows in such a position that it cannot readily be examined, it is a good plan to collect a quantity of these latter insects and place them upon it. The rose aphis has, however, another enemy, perhaps more destructive than either of the above, in the shape of a very minute metallic fly (*Aphidius cancellatus*) which deposits its eggs in the aphides, the larvæ feeding within. This fly is so small that it is seldom seen at large, but the dried carcases of the victimised insects may be readily observed fixed upon the rose leaves, and if collected and placed in a glass-topped box the parasites may be bred from them. Near to woods perhaps also the larvæ of some of the lace-winged flies (Hemerobiidæ) do their share in aphis destruction. These larvæ may readily be distinguished from those of the hovering flies in the fact that they have six legs on the front segments, and some of the species make a cloak of the aphis skins which is carried upon the back. Every rose grower should make himself thoroughly acquainted with all these insects, and with judicious care and proper selection, they will help him greatly in his work.

Among the artificial remedies employed for the destruction of these numerous pests, it will only be necessary to mention two. The first is that recom-

mended by Miss Ormerod as a general aphis wash, and which consists of one part of black soft soap boiled in eight parts of soft water, to which paraffin must be added while boiling, and the mixture bottled while warm. When required for use it is to be diluted with water, the strength depending on the state of foliage and severity of attack. Another wash is that recommended by Mr. Whitehead as being of general use in the Kentish hop gardens: viz., 6 to 8 parts quassia boiled in 100 parts of soft water and 4 to 5 parts soft soap.

The common cuckoo-spit insect, or froghopper (*Aphrophora spumaria*) often very common in gardens, is also injurious to roses and other plants, and there is also a scale (*Diaspis rosæ*) which is supposed to be peculiar to this genus of plants.

S. L. Mosley.

Beaumont Park, Huddersfield.

(*To be continued.*)

THE ECONOMICAL PRODUCTS OF PLANTS.

By J. T. Riches.

The Durian Fruit.—This is the produce of *Durio Zibethinus*, Linn., a tree belonging, according to the latest arrangement in Bentham and Hooker fils' Genera, Plantarum, to the family Malvaceæ, tribe Duriæ. It is a native of the Islands of the Malay Archipelago, and is now extensively cultivated both in the Peninsula and Islands. The present cultivated varieties are vastly superior to the wild form from which they have originated, and which still exists in the forests of Borneo and Sumatra. It is a very large tree, growing from sixty to eighty feet high, resembling in appearance an elm tree. Leaves alternate, oblong, acuminate, rounded at the base, entire subcoriaceous, densely covered beneath with minute scales, giving them a silvery-red appearance. Flowers produced in little clusters, on the main trunk or branches of a yellowish-green colour. Fruit variable in form, globular or oval, measuring as much as ten inches long, rather more than half as broad; it has a thick very hard rind, covered with hard short hexagonal spines, and is divided into five cells, each of which contains from one to four seeds, rather longer than a pigeon's egg, completely enveloped in the firm cream-coloured pulp, which is the edible portion, and its consistency and flavour is indescribable, and during the period when the fruit is in season, it forms a staple part of the food of the natives, and in a good fruit season large quantities are preserved in salt in jars and bamboos, and kept the year round, when the odour is very uninviting to Europeans, but the Dyaks are regardless of this, being accustomed to it, and they very much enjoy them as a relish with their rice.

Of all tropical fruits this is perhaps the most delicious, at least it has been so regarded by most travellers who have written and spoken in the highest terms of it. One thing is certain, if it may not claim rank as the king of tropical fruits, it is the one with the most abominable and offensive odour, which has been commonly compared either to putrid animal matter or rotten onions, and it would be inferred that a fruit with such an odour, would be most repugnant. This is so perhaps upon first acquaintance, but that is speedily overcome, and the durian in the end becomes a favourite. The old traveller Simchott, writing as early as 1599, says: "It is of such an excellent taste that it surpasses in flavour all the other fruits of the world according to those who have tasted it." And Dr. Paludanus adds: "This fruit is of a hot and humid nature. To those not used to it, it seems at first to smell like rotten onions, but immediately they have tasted it they prefer it to all other food. The natives give it honourable titles, exalt it, and make verses on it." Mr. A. Wallace ("Malay Archipelago," p. 75), than whom we want no better authority, says: "A rich butter-like custard flavoured with almonds gives the best general idea of it, but intermingled with it come wafts of flavour that call to mind cream-cheese, onion sauce, brown sherry, and other incongruities. Then there is a rich glutinous smoothness in the pulp which nothing else possesses but which adds to its delicacy. It is neither acid, nor sweet, nor juicy, yet one feels the want of none of these qualities, for it is perfect as it is. It produces no nausea or other bad effects, and the more you eat of it, the less you feel inclined to stop. In fact to eat durians is a new sensation worth a voyage to the East to experience. It would not be well perhaps to say that the durian is the best of all fruits, because it cannot supply the place of the subacid juicy kinds, such as the orange, mango, and mangosteen, whose refreshing and cooling qualities are so wholesome and grateful, but as producing a food of the most exquisite flavour it is unsurpassed. If I had to fix on two only as representing the perfection of the two classes, I should certainly choose the durian and the orange as the king and queen of fruits." Mr. Wallace also remarked upon the dangerous character of a durian plantation when the fruit is ripe, and liable to fall, and it is of frequent occurrence that such prove very serious to many persons during the season, and owing to the great weight of the fruit, and its spiny coating, a very bad wound is caused by a blow upon the head, but which bleeds profusely. At the same time he remarks it is astonishing how rapidly persons recover from the effects of such a blow.

The Mangosteen Fruit.—This is produced by *Garcinia mangostana*, Linn., which belongs to the Gamboge family (Guttifereæ). It is a native of the Malay Archipelago, where it is extensively cultivated. It has also been introduced, and is cultivated in the Southern and Eastern provinces of India, but it does

not there attain to such perfection as in the Malay Islands. It appears to have been introduced into this country in 1789, and it first produced its fruit in the gardens of the Duke of Northumberland at Syon, Isleworth, in 1855, from whence it was figured by Sir W. J. Hooker in the Bot. Mag., t. 4847, where it is also well described.

It is a large tree, with a freely-branched conical head, leaves oblong-elliptical, acutely pointed, entire, glossy, of a leathery texture. Flowers near the extremities of the shoots, solitary, on very short

Fig. 78.—Flower of *Garcinia mangostana*, Linn.

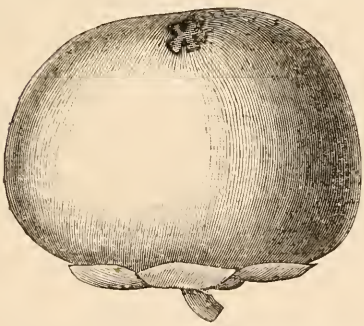

Fig. 79.—Fruit of *Garcinia mangostana*.

peduncles, of a dull red colour, and about the size of dog-roses. Fruit spherical in form, a section of which would be about three inches in diameter, and for which the tree is most highly esteemed, although it possesses other virtues which gain for it great favour. The fruit is largely used as an article of food, it is very luscious and wholesome, and with the last is one of the best tropical fruits. Dr. Abel, in his description of the fruits of Batavia, says: "First in beauty and flavour was the mangosteen. This, so often eulogised by travellers, certainly deserves much of the praise bestowed upon it. It is of a spherical form, of the size of a small orange when ripe, reddish-brown, and when old, chesnut-brown. Its succulent rind is nearly the fourth of an inch in thickness. It contains a very powerful astringent juice, and in wet weather exudes a yellow gum which is a variety of gamboge. On removing the rind its esculent substance appears in the form of a juicy pulp, having the whiteness and solubility of snow, and of a refreshing, delicate, delicious flavour. We were all anxious to carry away with us some precise expression of its qualities, but after satisfying ourselves that it partook of the compound taste of the pine-apple and peach, we were obliged to confess that it had many other equally good but inexpressible qualities." It is stated that any quantity of the fruit may be eaten without deleterious effects, and it is given with sweet oranges to persons affected with fevers, and, according to good evidence, Dr. Solander, in the last stage of a putrid fever at Batavia, found himself insensibly recovering by sucking this delicious and refreshing fruit. According to Dr. Garcin, in honour of whom the genus is named: "It is one of the most delicious of the East Indian fruits, and a great deal of it may be eaten without inconvenience; it is the only fruit which sick people are allowed to eat without scruple." Mr. A. Wallace ("Malay Arch.," p. 84), in describing Saráwak, says, "a cool spring under an overhanging rock just below the cottage furnished us with refreshing baths and delicious water, and the Dyaks brought us daily heaped-up baskets of mangosteens and sunsats, two of the most delicious of the sub-acid tropical plants."

The bark of the tree is astringent, and a decoction of it is used by the natives in dysentery, etc., and the Chinese prepare a black dye from it.

A NATURALIST ALL AT SEA.

IT was in February that I jotted down a few notes near the Equator, outward-bound for Australia.* I wrote under difficulties—for a head-wind and choppy sea interfered sadly with our action, and I upset a bottle of ink over the counterpane in my berth, amongst other misfortunes.

Sydney was my farthest point from home. Our ship—the P. and O. "Victoria"—entered the heads at five o'clock A.M. I was already on deck, knowing full well that one of the finest sights in the world would shortly be revealed.

The gap in the precipitous headlands is so narrow that even Captain Cook himself at first sailed past without discovering the entrance. He landed at Botany Bay, marching overland to behold Port Jackson; a stupendous revelation it must have been!

* SCIENCE-GOSSIP, April, 1888.

Written descriptions convey but a slight impression of Sydney Harbour. Within the heads, altogether hidden from the sea approach, lie numbers of peaceful creeks, bays, and protected sheets of water penetrating inland in all directions, surrounded with verdure-clad rocks and thickly-wooded land to the very water's edge. Charming suburbs fringe the sandy bays, and deep water extends in most parts right up to the rocky coast line. More than ten miles up the harbour, where the steam ferry crosses from the Circular quay to North shore, there is fifty to sixty feet of water in the main channel; and in Middle Harbour a steamer goes direct to the rocky ledges to land passengers; no landing stage is required, for the depth of water is ample.

One of my first experiences was in shark fishing. One or two young officers of the "Victoria" started off in a tiny steam pinnace with ingeniously contrived tackle to snare a wily monster of the deep. An enormous hook and line was baited with a leg of salt pork; an empty biscuit-tin being used as a float. In less than an hour the whole concern disappeared suddenly beneath the water; most vigorous tugging indicating that we had a bite. In a few minutes it was an open question whether our frail boat should be spun round and round at the sweet will of an infuriated shark, or whether we might tow him securely to shore. Eventually he was drawn ashore; the head was cut off to ornament the bows of the boat as a trophy, and a careful measurement gave the entire length of the beast as fourteen feet; in his stomach were a goodly number of recently swallowed fish. The party on returning to the ship received an ovation, and regained the deck literally swollen with pride.

I had often enough heard of the Port Jackson shark, and besides the rows of sharp-pointed teeth, I could not help being struck with the smooth, ribbed palatal teeth, not so unlike those excavated from the Sussex Chalk, I think of the genus Ptychodus. In fact, the connection of the Australian flora and fauna with past geological periods crops up at every turn you take in the country.

Shortly after landing in Sydney, I sat down to lunch at Petty's Hotel. The first thing offered happened to be fresh oysters—a mollusc I never eat in the raw state. At a glance, I perceived something strange about them, and took a specimen on my plate for examination. It was for all the world like the fossil *Ostrea carinata* that I had so often hammered out from the greensands in the Isle of Wight. Each valve is long in proportion to width, crenulate at the edges and quite unlike the English "native." They appear succulent, judging from the manner in which they were disposed of at lunch. Any quantity can be gathered from the rocks in Sydney Harbour, as Dr. Taylor remarks, in his interesting Australian book.*

* 'Our Island Continent.'

Clusters may be seen from the Botanic Gardens skirting the bay.

At the Sydney Museum, through the kindness of R. Etheridge, Esq., I saw a fine series of the recent Trigoniæ, strange survivals of the past. At least three species remain, the largest in Tasmanian waters, the two other occurring in isolated spots near Sydney. The initiated few can usually dredge up a specimen or so, but the localities are not generally known.

Here again the life history of this bivalve throws us back to Oolitic and greensand epochs. The small species, with circular knobs on the ribs, is the rarest, and at once reminded me of a larger type from the Atherfield clays—*Trigonia dædalia*, I think.

On the beach at Manly, I saw a small boy carrying an octopus nearly as long as himself. It had been stranded on the sand, and he had secured his prize. Each tentacle must have exceeded a foot in length, and the hideous creature changed colour, blushing, so to speak, from purple to red. His prominent eyes started from the head, and the double rows of suckers still had adhesive powers.

On another occasion I was in the fish-market, and bought a dozen cuttle-fish (sepia) by auction for sixpence. These creatures were of great interest. I extracted the internal shell, which, pressed and dried, forms a beautiful object. It might be compared to the feathery end of a quill pen, with clear, transparent, talc-like substance in place of feathers. Then I investigated the ink-bag, filled with murky fluid, with which I had no difficulty in writing a letter. It is curious to observe the circulation of inky globules beneath the skin of the sepia; it causes an incessant change in colour and apparently never ceases. Has the animal the power of forcing the fluid from the bag through the system; or is the black fluid separated during circulation to be stored up as a defensive power? I do not know how the matter is originally secreted. Sydney Harbour is full of medusæ, squids, and gorgeous floating cephalopoda.

I spent a happy day rambling through endless marshes—high up in the Blue Mountains, near Katoomba. It was in the month of March, rather late for an abundant flora, but ample material remained, and the sundews alone afforded a day's occupation.

In the previous week I had gathered specimens of *Drosera pygmæa*, at Watson's Bay, Sydney, a minute plant one-third the size of our own *D. rotundifolia*, which grows in dense masses of miniature rosettes in the crevices of rocks.

To-day I found any quantity of *D. spatulata*, with white and rose-coloured flowers, fully expanded, the specific name accurately describes the leaves, which have also brilliant red hair-glands with dewy points, in many cases having insects attached. Another interesting plant growing by the side of a peaty stream, was *D. binnata*. It has singular pairs of linear hairy leaves bifurcating from each stem, thus

forming a kind of horse-shoe, fringed with the sticky glands. The flower was completely withered; I think the petals are large and white, the loose, terminal head of flowers growing in an irregular corymb. I tried an experiment with one of these plants. A large ant ran on a fragment of wood close at hand. I carefully placed him in the centre of the Drosera leaf, where, in spite of struggles, the viscid matter secured the prey; more than this, the whole horse-shoe gradually folded over the unfortunate ant, revealing clearly the irritable nature of the hairy leaves. I saw numberless insect cases attached to other Drosera plants; mere shells, with all juices extracted. I have some recollection of a woodcut of this species in Dr. Taylor's book, "The Morality and Sagacity of Plants." Growing several inches from the ground, hidden away in clumps of coarse grass, was another form of Drosera, differing widely in character from the preceding species. It was *D. auriculata*, with spiral stem, and crescent-shaped leaves on separate pedicels, having terminal pure white flowers; a rosette at the base of the plant, clinging close to the soil, as with our commoner forms.

I am convinced this plant has learned to grow upwards, the better to secure living prey—unwary flies are more readily entrapped. This is not pure supposition. I noticed many scores of seedlings on a dry, sandy patch of ground. Here were the different stages of development. Some had simply the rosette of leaves; others had an abortive spiral growth; comparatively few showed a vigorous upward growth. I could have gathered a complete series, from the simple rosette of leaves to the spiral plant. In my opinion, they have simply learned to grow high up for the special purpose of food capture.

Another small Drosera I found in one rocky place; I cannot supply the specific name, for the plant was not in the Sydney Herbarium. The roots were fleshy and bulb-like, to be compared with miniature round radishes. The leaves were peltate on separate, radical stems, being distinctly green, sparingly covered with brown hairs; flowers not visible at this season of the year. (*D. peltata?*)

(*To be continued.*)

BOTANICAL NOTES AT HASTINGS.

By P. F. Gillett.

VERY few towns have had so much attention paid to their Natural History features as Hastings. For this great credit is due to those untiring workers in every branch, through whose exertions the "Fauna and Flora" have appeared. Additions to it are however constantly being made, which are recorded in supplements, two of which have been issued. To mention a few of the plants observed during a visit in the early part of July is the object of this paper.

The rigid and hare's-foot trefoils (*Trifolium scabrum* and *arvense*) were observed on the cliffs below the castle, together with a few patches of *Sedum Anglicum*. The latter, however, grew more plentifully on the East Hill and above Lover's Seat. The biting stonecrop (*S. acre*) was abundant among the loose stones near the beach at Bopeep, together with the sea campion, viper's bugloss, horned poppy (*Glaucium luteum*), and one or two spergularias. In a small marsh by the cliff at Bulverhythe the glasswort, sea arrow-grass (*Triglochin maritimum*), sea-milkwort (*Glaux maritima*) were met with, the latter in some abundance; while a ditch nearer Bexhill produced *Carex vulpina* and *Scirpus maritimus*. On another occasion the sea-shore west of Bexhill was the ground chosen. The sea-kale (*Cakile maritima*), with its fleshy glaucous leaves, grew in several places along the beach, and in moist places in the sandy cliffs the brookweed (*Samolus Valerandi*) was to be seen.

Battle with its abbey calls for mention. *Epilobium montanum*, *Parietaria officinalis*, and the ivy-leaved toad-flax grew plentifully from the walls with various species of fern not mature enough for identification. In some muddy ground in a neighbouring lane a few specimens of the water purslane (*Peplis Portula*) were seen. A white-flowered specimen of *Epilobium montanum* and one of herb-Robert (*Geranium Robertianum*) were the only albinos seen. Around Battle are to be seen some of the prettiest lanes in Sussex.

A visit paid to Guestling, the home of that rarity *Centaurea Jacea*, was productive of several unpossessed specimens. Through the kindness of that veteran naturalist, the Rev. E. N. Bloomfield, M.A., of Guestling, I was enabled to obtain a few specimens of that plant, which seems undoubtedly wild in the meadows in which it grows. Another plant which has only been lately noticed here, is that rare thistle hybrid *Cnicus Fosteri*, a cross between *palustris* and *pratensis*, almost visual proof being afforded by the occurrence of the parent plants not many yards from each other. A few umbellifers seen were hemlock (*Conium maculatum*), chervil (*Chærophyllum temulum*), water-dropwort (*Œnanthe crocata*), and *Œnanthe Phellandrium*, with its thick bamboo-like stems. *Trifolium hybridum*, at a glance very like the common Dutch clover, and *T. incarnatum*, with its tall crimson heads were evidently escapes. The marsh cinquefoil (*Potentilla Comarum* and *Corydalis claviculata*), were also found here.

The above are of course only a few of the plants noticed, and as the district is very productive in all branches of natural history, Hastings can certainly be recommended in answer to the "Where shall I go?" of the naturalist. The number of Phænogamous plants on the list being so great, the drying paper of any one botanically avaricious would be always "in active service."

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Absolute Alcohol.—The difficulty of obtaining this is considerable. Ordinary distillation separates alcohol from water but imperfectly, the water and the alcohol adhere so firmly that when a mixture of these, such as always is first obtained in the manufacture of alcohol, is distilled, some water comes over with the alcohol although the boiling point of the latter is so much lower than that of the water. Thus, ordinary "spirits of wine" or the "Rectified Spirit" of the pharmacopœia, contains but 84 per cent. by weight of pure alcohol, and official "Proof Spirit" contains but 49 per cent. This proportion was originally determined by the old method of testing or proving the strength of the mixture. A small quantity of gunpowder was moistened with the liquid to be tested and then a light applied. If it fired the gunpowder, it was said to be "over proof;" if not, "under proof." The weakest spirit that will stand this test is what we now describe as having specific gravity 0·920 at the temperature of 60°, which is the modern excise proof standard.

The ordinary method of removing all the water or obtaining absolute alcohol is to invoke the strong affinity of quicklime for water, by adding this, or a mixture of it with alkaline carbonate, to the simply distilled spirit and then to distil again. The lime holds back the water, and if the process is skilfully conducted, absolute alcohol finally comes over from the still, having a specific gravity of 0·7938.

Another method of separating the water has been recently devised. Gelatine, in its soluble form, absorbs water very freely, but is a total abstainer from alcohol. By suspending thin sheets of gelatine in diluted alcohol the gelatine will take up the water and leave the alcohol behind, and we are told that in this manner absolute alcohol is obtainable without distillation. The process is curious and interesting, but I do not vouch for its complete efficiency.

The Purification of Alcohol.—Intimately connected with the above is another recent announcement of a new method of removing that bugbear of the distillers—fusel oil—from alcohol. Hitherto this has been practically effected by the very simple yet expensive process of ageing, keeping the spirit—such as whisky—for some years in the cask, during which period the proportion of fusel oil gradually diminishes, and the spirit diminishes in strength from over proof —to much under proof. I have never met with any account of the rationale of this change, but have supposed that between the fusel oil and the wood of the cask there must exist some selective adhesion whereby it enters the pores of the wood, passes slowly through and then evaporates from the outside. This theory is supported by the fact that, after bottling, the action is so much reduced that the exosmosis appears to be limited to the cork.

The new method consists (omitting details) in mixing with the raw spirit a hydrocarbon, *i.e.* a liquid of the same class as the resin existing between the woody fibres of the cask.

The fusel oil adheres to the hydro-carbon—i.e. mixes with it, while the alcohol remains unsociably apart, and its purification is thereby effected. High authority is quoted in affirmation of the completeness of this purification. My only difficulty in accepting all that is stated in favour of the process is that a limited company is either afloat or in course of flotation. One becomes brutally cynical in these days concerning anything and everything that appears on the prospectus of any such company.

Volapük.—The recent agitation in favour of this cacophonous innovation reminds me of an experiment I made about thirty-five years ago in a school which was founded in Edinburgh by the late George Combe, James Simpson, William Ellis, and other advanced educationists. The primary object of the experiment was to determine the amount of time that might be saved in learning to read and spell the English language when divested of its barbaric orthography.

A class was formed of little children of both sexes, taken at random, and who had not yet begun to learn the alphabet. These were taught to read books printed in the phonetic type devised by Mr. Alexander J. Ellis (that in which "The Phonetic News" was printed), by a young pupil teacher in the ordinary school hours. In the course of about eight months they could all read easily and freely Bible selections and other matter printed in the phonetic type. Reading and spelling of course came together, the spelling being merely a natural analysis of the sound of the word. Then came the transition to ordinary type. The resemblance between the forms of whole words in both types rendered this very easy; it was effected in about two months longer. But the miserable business of ordinary spelling still remained. Herewith commenced the usual training in intellectual degradation, the violation of all logical consistency in the first efforts of intellectual education. The mastering of this abomination demanded as much time as would be necessary for learning altogether one or two modern languages.

We commonly envy the linguistic attainment of the Germans, but forget that a German child requires no spelling-lessons in his own language beyond learning the phonetic value of the alphabet and the correct pronunciation of the word to be spelled.

But what is the connection between this and the Volapük controversy? Simply that when we—or rather the Americans, who are sure to outstrip us in this —adopt a thorough spelling reform, such as Ellis's or that more recently devised by Melville Bell, the

English language will at once become the medium of communication between all the nations. In every other respect but its vile spelling, our tongue stands pre-eminent as the simplest and best that human beings have spoken, and, besides this, it has now such a start in the race for universality that it is certainly destined when orthographically purified, to debabelize the world.

A Sensational Cure.—Many of my readers have probably read the paragraph that has appeared in many newspapers narrating the wonderful cure of a blind man by a flash of lightning. The "British Medical Journal" disposes of the marvel by a simple sifting of the facts. The man was injured by an explosion in a mine; one eye was totally destroyed, and he became unable to see with the other. He was in hospital for seven weeks with fits, and on leaving was led about, owing to his defective sight. One evening after a flash of lightning he noticed that he "could see indistinctly objects near to him." A few days after he could walk about without a guide. On enquiry, the editor of the journal learned that for some time after this the patient could only partially open one eye, that the cornea was opaque, and had been gradually clearing for many months past, and adds, that in the absence of any authoritative statement as to the condition of the vision before and after the lightning flash, there seems no reason for assuming that the case was anything but an ordinary one in which the cornea was slowly clearing. Nothing is more common than for a gradual improvement to be suddenly noticed when it has reached a certain stage.

Imperfect Combustion.—All who have experience in the use of mineral oil lamps must sooner or later learn that the condition demanded for their burning without smell is that the wick shall be turned up so as to obtain a full-sized flame without actual smoking. It is commonly supposed, at first, that by keeping the flame low all objectionable odour is prevented, but the contrary is the case. Something more may be learned, by first charging a lamp with a measured quantity of oil burning it with the flame at full size for a given time and ascertaining the loss of oil; then making a second experiment with the same lamp, same quantity of oil burning the same time, but with wick turned down so as to have but a fraction of the amount of light supplied during the first experiment. On measuring the loss of oil this time it will be found but little less than in the first case. Therefore in turning down such lamp flames we obtain no such saving of material as in turning down a gas flame.

The reason is that with the low flame a considerable quantity of the products of incomplete combustion are making their escape into the air, and these are not only offensive to the sense of smell, but are also injurious to health, they are analogous to the vapours that are created by blowing out the flame of a tallow candle and leaving the wick to smoulder.

M. N. Grébant has recently studied the action of the much milder products of the imperfect combustion of coal gas, by placing a dog in a chamber of twelve metres' capacity in company with an ill-supplied Bunsen burner. A comparison of the gases of the blood taken from the carotid artery, before and after the experiment, showed that the oxygen of the original blood was almost wholly displaced by carbonic oxide.

Exhaustion of Soils.—The virgin soils of Australia are suffering a form of exhaustion due to the loss of nitrogen. Mr. R. W. E. Macivor has written on the subject in "The Chemical News," vol. 57, p. 25, pointing out the causes of this, one of them being the practice of burning the straw instead of returning it to the soil as we do after it has done its work as litter for cattle and horses. I refer particularly to this, as such wastefulness is not peculiar to Australia. Ignorant gardeners and ignorant farmers burn the weeds they remove from the soil, and in doing so cast all the ammonia they contain into the air, and then purchase guano imported from the other side of the world to replace the loss. If these weeds were properly stacked and sufficiently rotted to destroy the fertility of their seeds, they would, when returned to the soil, constitute the best of all possible manures, because they return to the soil just what they have taken from it.

In ordinary gardens the crop of weeds far exceeds in exhaustive energy the sum total of all the other crops. In flower gardens this excess may amount to ten or a hundredfold, and yet many gardeners are deliberately guilty of the heinous offence of carting away the weeds bodily, which is still worse than burning them, as in the latter case the ash, with its mineral salts may be returned. It is not always ignorance that induces this wasteful proceeding. I have noted the doings of more than one gardener who has a small nursery of his own, and who also attends to the gardens of villa residents in the neighbourhood. I found that most of these studiously throw away the weeds from the gardens of their employers, and religiously save their own. They commonly make a profit on the stable manure which they purchase for the purpose of compensating the unreplaced exhaustion of the outcast weeds. In some cases, of course, the employer not the gardener, is the culprit, the latter merely obeying orders, or the garden in question may be a little back yard all too close to the house to allow space for a weed heap. In every case the waste is shameful, and only mitigated by the fact that somebody else may appropriate the castaway weeds and use them properly, and in the case of burning that some of the ammonia may be washed from the air by rain to improve the crops of more deserving agriculturists.

A DAY'S SHELL COLLECTING.

By Dr. J. W. Williams, M.A.

On Wednesday last (June 8th), the weather being fine and the wind freshly blowing, Mrs. Williams and I put into effect a long contemplated day's visit to the River Lea and the necessary accompaniment of a good search with the scoop into the water for shells. Mr. Wallis Kew had paid fleeting visits with me to the river before, for the same purpose, but we had never stayed so long as to make a thorough examination of the river's bed. On the day of which I am writing this paper we started from my residence, near Regent's Park, a little after ten in the morning, and reached our destination about mid-day, and worked hard and fast till the shades began to lengthen, and the watch to tell us that it was getting near the time of evensong. Never have I spent a more delightful day with nature on the outskirts of London. Never on the outskirts of London have I felt more deeply thrilling in one's very soul the ever-recurring miracle of the mystical yet sanely realistic, Walt Whitman—

> "To me, every hour of the light and dark is a miracle,
> Every inch of space is a miracle,
> Every spear of grass—the frames, limbs, organs, of men and women, and all that concerns them,—
> All these to me are unspeakably perfect miracles."

Yet, not like the pure, pure country, but for all that, still enjoyable and delightful.

I have never taken so many *Sphærium rivicola* as I took on that day. Almost every sweep of the scoop brought up some for my collecting box; and more were taken in one spot than in another, which evidently shows a tendency to gregariousness on the part of these, our largest species of the genus Sphærium. They are pretty bivalves, oval in shape, and much ventricose around, and in the neighbourhood of the umbones, markedly sculptured with raised striæ running concentric with the umbones which are central in position and bluntly pointed; the colour is yellowish, banded, or otherwise marked, with blackish brown, and the whole shell carries a length of 19 mill., and a width of 15 mill. The younger ones are much flatter in shape, less ventricose, paler, and not marked with blackish-brown. The shell seems to age first by an extension in length and breadth, and then by an extension in width, for as it becomes older and older, so does it become more ventricose. This ventricosity is more pronounced at the umbo—the umbo being the baby-shell; so that the adult carries, as well as its own likeness, a miniature of itself. *Sphærium corneum* were present there too, and specimens of its varieties *compressa* and *flavescens*. The former of these varieties was described by Dr. J. E. Gray as "shell rather compressed, margins meeting at an acute angle,"* and by some chance or other has been overlooked by Dr. Gwyn Jefferys, Rimmer, and Adams; the latter is paler, not so large, and more globular than the type, and was first described by Macgillivary as *Cyclas flavescens* on p. 246 of his "Molluscs of Aberdeen." *Sphærium corneum* is common almost everywhere, but *Sphærium rivicola* is more or less local in its distribution.

Closely allied to the Sphæria are the Pisidia, both genera belonging to the family Sphæriidæ, and of the genus Pisidium only one species was taken, viz., *Pisidium amnicum*. It is an extremely difficult matter to tell the Pisidia from the Sphæria, and although some conchologists will stake their word on the examination of the shell merely, I will not, and must have the animal before I will come to a definite and conclusive diagnosis. It is then, if you have the animal, an easy matter, for if a specimen belongs to the genus Pisidium it has one siphon, and if it belongs to the Sphæria two siphons; if it be a very young Anodon or Unio it has no siphons at all. That is the only conclusive test, and that I recommend to all shell-workers as the only positive way whereby they can diagnose the genus. Get your one siphon and then tell the species by the shape of the shell if you like; it is triangular in *Pisidium amnicum* and *P. fontinale*, oval in *P. pusillum*, round in *P. nitidum*, and oblong in *P. roseum*. *Pisidium amnicum* and *P. fontinale* are the only two alike in the shape of the shell, it being triangular in both species, but the shell of *P. fontinale* is far more tumid (almost cuboid), more transparent, thinner, and not so deeply grooved concentrically. I cannot pass by the Pisidia without mentioning that *Pisidium pusillum* differs from all other lamellibranchs in having the sexes united in the same individual; just as *Limax* (*Eulimax*) *lævis* differs from all the Pulmonata in having the sexes distinct.

Of the Anodons I took one *Anodonta anatina*, and of the Unios, three *Unio tumidus*. I have not much to say of these except that *U. tumidus* is the most plentiful of the Unionidæ in the River Lea, and that *A. anatina* can be easily distinguished from *A. cygnea* by the angle which its ligament makes with the lower margin of its shell, and that *U. tumidus* can be as readily distinguished from *U. pictorum* by the wrinkled condition on its umbones. Dr. Henry Woodward has lately considered it his duty to make the statement that *A. anatina* is but a variety of *A. cygnea*, and in the absence of his giving any proofs for this somewhat uncanonical assertion, and on the grounds of the difference well marked between the two types, I must hold his idea as arguing badly for his knowledge of the constitution of a species and of a variety. Anatomical differences apart, there is enough in the shell to warrant us in still holding on to it as a good species.

Passing on now to what Cuvier termed the Malacozoa Gastropoda; of the family Paludinidæ I took, *Paludina vivipara* and *Bythinia tentaculata*.

* *Vide* "Shell-Collector's Handbook for the Field," p. 47.

One of the *Paludina vivipara* was the largest I ever took, and didn't my eyes glisten when I saw the giant crawling up the muddy sides of the stream; it was a well-marked specimen with a longitudinal measurement of 38·5 mill. and a transverse diameter of the aperture of 19 mill. *Bythinia tentaculata* was there in plenty.

Valvata piscinalis was in tolerable abundance in the weeds on the bottom of the river, and also some little specimens which closely simulate it on first look, and of which I must warn the young collector, viz. baby *P. vivipara*; but by an old hand they can be at once distinguished, for where is the umbilicus, the peculiar twist on the last whorl as you look at it from the side of the aperture, and the old operculum? *Valvata piscinalis* is umbilicated very distinctly, the operculum looks old and brownish, and it has a peculiar twist on its last whorl; the young *P. vivipara* has no, or if present, it is extremely slightly marked, umbilicus, the operculum is so thin that it can scarcely be distinguished on the body of the animal, and there is none of that peculiar twist on the last whorl. The young *P. vivipara* with the animals in them look very pretty things indeed, and they would make very pretty things too for the collection, because they appear to be marked with three black bands which come out well in relief; but on extracting the animal only a transparent horn-coloured and extremely fragile shell is left without the banding, for that has disappeared with the animal, it being present on that portion of the animal which is known as the mantle. As the shell becomes older, this colour is laid down in it by the free edge of the mantle from which it is secreted, and thus the characteristic markings of the adult shell is typified in the markings on the mantle of the embryo.

Several purple-mouthed *Limnæa palustris* were also taken, and plenty of *Limnæa peregra* and *Limnæa auricularia* with "intermediate forms" between these last two species. *Limnæa peregra*, vars. *labiosa* and *succineæformis*, were the most plentiful, and some specimens which cannot be told whether they are peregras or auricularias, and which is best to designate as "intermediate forms" for *Limnæa auricularia* seems to have been evolved from *Limnæa peregra*, not only because of the presence of these "intermediate forms," or mesostates, as they may be termed, but on account of the great resemblance the two species bear to one another in their internal structure, especially in the reproductive organs, where, if anywhere, the greatest differentiation would be expected. All the Limnæa have been seen floating; Mr. Wallis Kew first observed *L. truncatula* doing this in Lincolnshire; and I have lately had the pleasure of completing the list by observing *L. auricularia* doing the like.

The pretty and delicately formed *Physa fontinalis* was also taken; and also specimens of a small narrow and thin *L. stagnalis* which to me does not seem worth a variety-name, but which nevertheless is named var. *fragilis*. There must indeed be some hard and fast line drawn in naming varieties, or else we shall all be overwhelmed in a deluge of variety-names, for in no other zoological group, with the exception, perhaps, of the leeches, does variation occur to such a great extent as in the Mollusca.

AFTERGROWTHS AMONG HARDWOOD AND CONIFEROUS TREE STUMPS.

By Robert Coupar.

The aftergrowth of Hardwood and Coniferous tree stumps is a subject of much interest to the scientific and practical student, inasmuch as it affords us a pleasing and instructive study to master the details and explain the cause of this curious and interesting freak of nature.

That some trees of the hardwood species do grow after being cut down is well known; the roots draw sap from the soil which circulates through the root and stimulates those latent and hidden buds contained in the bark into growth, becoming shoots, and finally increasing to copse, ultimately reaching a tree none the less inferior to its parent, which may be again cut down and the same process repeated over and over again.

Now, if we were to destroy the bark, this physiological property would be entirely destroyed, hence, in regenerating copse woods, the great care of protecting and saving from injury is apparent.

Now, in the case of coniferous trees which have not this physiological property of pushing out young shoots and leaves from the felled stumps, how can they grow as formerly, is the main inquiry?

In some works, for instance, arboricultural work, the authors have fallen into the error of saying they have the power of growing after being cut down: and recently, at a society's meeting at Edinburgh, some authors positively asserted they had known several instances of isolated and other stumps continue growing for very many years after being cut down. Such assertions are entirely misleading, and have been given before the writers made themselves in the least acquainted with the life and various functions of plant-life.

We have observed that hardwoods produce leaves and shoots which elaborate, the sap returning again by the bark to be converted into woody tissue, hence, no leaves, no growth, unless by a system inarching or engrafting.

Since, then, conifers are not capable of sending out shoots and leaves, they have no elaborating organs of their own; in other words, they have no lungs, for the leaves are compared to the lungs; they are the breathing organs of the plant. Then these coniferous stumps cannot possibly grow after being cut down, unless they have been previously engrafted

when the trees were in full connection of all their junctions.

By referring to illustration A, which represents two coniferous trees (larch) engrafted, or inarched, as it is sometimes called, and the sap ascending and descending, is moving from one tree into the other; now, if we cut down one of these trees and leave the other standing, this standing tree will perform the part of a nurse, the elaborated sap from the leaves of the nurse-tree will circulate into and through the root of the felled tree, and consequently not only keep it alive, but will live and make wood just the same as if it had been in full connection of all its parts, leaves, branches, and stem. Certainly, when the nurse-tree is removed, the stump will die.

Again, the root of the felled stump may, and in many cases will extract sap from the soil and send the same through to the nurse-tree, although the roots performed no function whatever. For instance, suppose you were to cut all the roots with a pickaxe and gently lift the stump or root out of the ground, and placed it upon some other object, the stump would grow, provided the leader was not severed or injured.

Illustration B represents a larch tree growing on Lord Mansfield's estate, Scone Perth, having six of these aftergrowths, all depending for support upon the one tree. Fig. 81 is entirely grown over with the aftergrowth; they are only partly covered over, while the heart wood of the former tree has entirely disappeared and quite rotten, having a hole quite through. Numerous instances of these growths in all stages have come under my notice when thinning woods; many instances where close planting produced an aftergrowth which in after years I found nearly enclosed in the future layers of some of the larger roots.

These stumps were at one time all trees, having been cut down when about fifteen years old, and were

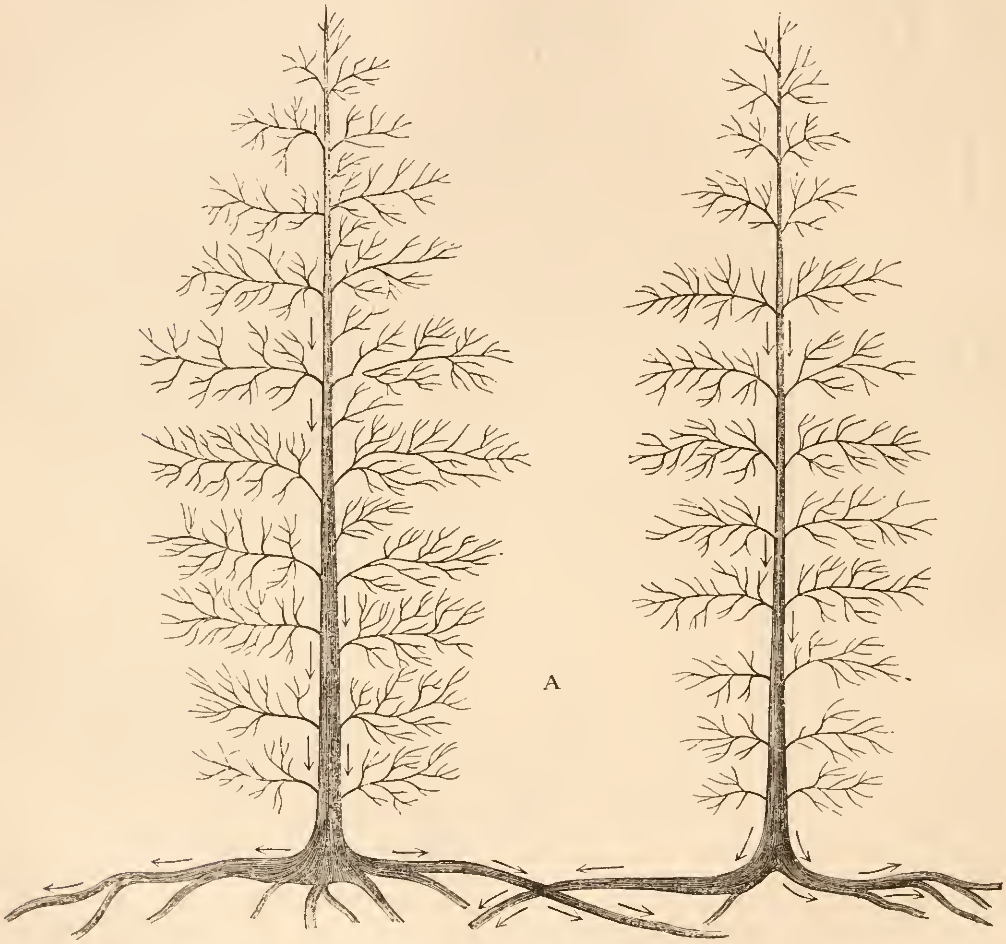

Fig. 80.—Larch, showing natural engrafting.

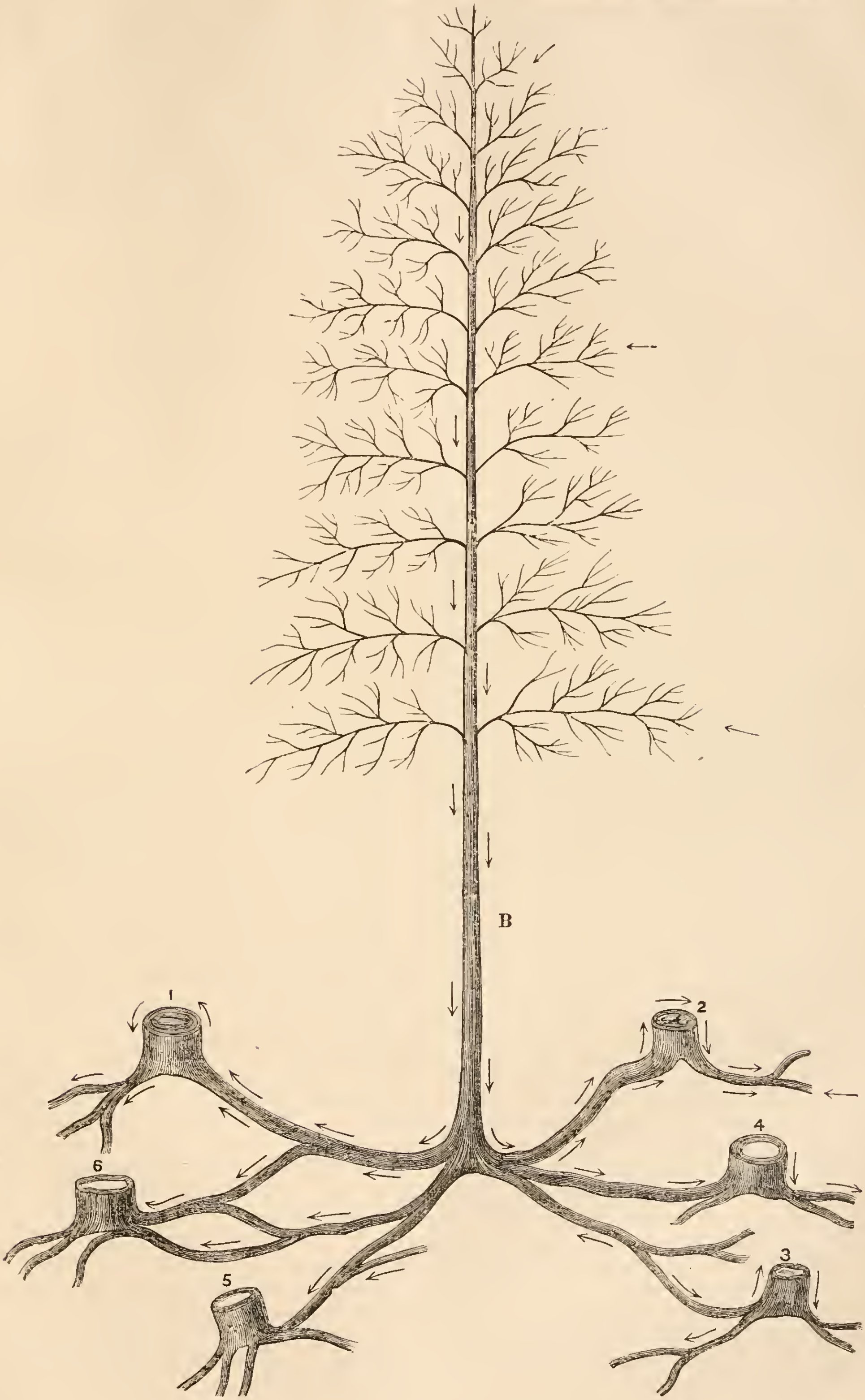

Fig. 81.—Larch having six aftergrowths, all supported by one tree.

living a few years ago, while the parent was over seventy years of age, and will continue growing as long as the nurse-tree lives.

A remarkably perfect specimen of this aftergrowth was exhibited by me at the S. A. B. Society, in Edinburgh, a few years ago, and obtained the society's silver medal. The same specimens were exhibited at The Forestry Exhibition in Edinburgh.

I may here mention, careless observers in going over old woodlands, where larch, spruce, silver, &c., are left, might have observed an effort on the part of the stump to produce an aftergrowth. But there being no nurse-tree to feed them, their existence is only until the elaborated sap is used which will be the first year after being cut down.

Silver, Douglasii, nobilis, Albertania, spruce larch will produce aftergrowths quite freely: also some other pines. But it seems the pine tribe have not the same property of freely growing over, although on examining any suspected specimen it will be found they are growing and making wood a little under the surface.

Again, to illustrate this more clearly, as I am anxious these growths should be thoroughly understood, suppose, for instance, that a man receives an injury, having lost so much blood thereby that it is found he has not enough to nurse the various organs of his body until more blood could be made to make up what was lost: suppose, then, all the bodily functions are quite healthy; if an opening is made in his arm, whereby more blood could be passed into his body from the arm of another man beside him, the man would recover. Now this admirably illustrates the present case before us. The tree has been deprived of its elaborating organs; it has no way of manufacturing blood (sap), but the nurse-tree performs that function for it, and supplies it with elaborated sap (blood), which not only keeps it alive, but forms wood yearly, the same as if it had been in full connection of all its functions. Nor does this exhaust my observations. Not far removed from the tree given in the illustration, I found another remarkable instance of aftergrowth. A leader from one tree had become engrafted into the leader of another tree about four feet from the stem. In this case the roots were both running in the same direction. After the tree had been cut down many years, and all the wood rotted away, I discovered that the shell of the main root, practically known as the "tapins," was alive, being fed by a nurse-tree, and had been making faint layers of wood almost unrecognisable for many years. This specimen was also exhibited.

Again, I have found numerous instances of natural engrafting among stems and branches. This might form the subject of another paper.

Now, in the first place, it is observed that, in order to produce an aftergrowth, the trees must become engrafted during life, when connected they will live on as long as the nurse-tree lives.

A slight difference takes place among hardwoods which become engrafted. They grow on as long as they are fed by the nurses the same as the Conifers. But should these hardwoods throw out leaves and shoots, as is sometimes the case, they might then continue to live, although deprived of the connection and the nurse, because then they would have lungs of their own (leaves). If they had not these, then if severed from the nurse they would die the same as would Conifers.

Ashford Castle, Galway.

ASTRONOMY AND METEOROLOGY.

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

ANOTHER American observatory is to be provided with a very large refracting telescope; this fortunate observatory is Denver University, Colorado, which is to have a new refractor 20 inches in diameter. The expense of this is to be defrayed by Mr. H. B. Chamberlin, of Denver. The instrument will be mounted 5000 feet above sea level, that is 800 feet higher than the great Lick refractor.

It is a strange thing that none of our great capitalists should present such a telescope to one of our observatories. England is now behind every country in Europe, and, of course, immeasurably behind America, in optical means of research in astronomy.

Such great apertures should be of enormous value in photographing the heavenly bodies, and it is now evident that the future of astronomy lies entirely in this direction.

At the meeting of the Astronomical Society of France, held on July 6th, Mr. Trouvelot presented the society with a set of photographs of celestial objects made at the observatory of Harvard College, U.S., and forwarded by Mr. Pickering.

The photograph of the Pleiades is peculiarly interesting, as it shows the same curious rectilinear trails of the nebulous matter which are so strikingly visible in the last photograph taken by M. M. Henry.

Really valuable photographs of nebulæ cannot be taken except with telescopes of large aperture.

There will be no occultations, eclipses, or other celestial phenomena of interest during September.

Mercury will be an evening star during the latter half of the month.

Venus will be an evening star throughout the month, and will be in Virgo near to Spica on the 22nd.

Mars will be an evening star, but will be too low for observation.

Jupiter will be an evening star, and will be near Mars on the 12th.

Saturn will be between Cancer and Leo.

Meteorology.—This subject is unfortunately so fertile of interest that to treat it adequately would require

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in July.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿ .	2	6 2M	0 33A	7 4A
	9	6 45M	0 49A	6 53A
	16	7 24M	1 1A	6 38A
	23	7 57M	1 10A	6 23A
	30	8 25M	1 16A	6 7A
Venus ♀ . .	2	6 35M	0 55A	7 15A
	9	6 57M	0 59A	7 1A
	16	7 20M	1 3A	6 46A
	23	7 41M	1 7A	6 33A
	30	8 4M	1 12A	6 20A
Mars ♂ . .	2	0 25A	4 39A	8 53A
	9	0 24A	4 30A	8 36A
	16	0 22A	4 22A	8 22A
	23	0 21A	4 15A	8 9A
	30	0 20A	4 9A	7 58A
Jupiter ♃. .	2	0 38A	4 58A	9 18A
	9	0 15A	4 34A	8 53A
	16	11 53M	4 11A	8 29A
	23	11 32M	3 48A	8 4A
	30	11 10M	3 25A	7 40A
Saturn ♄. .	2	2 42M	10 19M	5 56A
	9	2 19M	9 55M	5 31A
	16	1 56M	9 30M	5 4A
	23	1 33M	9 6M	4 39A
	30	1 9M	8 41M	4 13A

more than the whole number of SCIENCE-GOSSIP. What weather there has been will be seen in the weekly summaries which appear below, but I must mention that the 11th of July was colder in some places than the corresponding day in January, and the rainfall was between four and five times the average, so that nearly 1000 tons of water fell to an acre.

The unfavourable weather has militated greatly against astronomical observations being made, so that there is less to chronicle than otherwise would have been the case; but this exceptional weather has greatly increased the interest in meteorological results.

As I was unavoidably prevented from writing my paper on Astronomy and Meteorology last month, I have given here the meteorological results of the two months, as I believe they will be found exceptionally interesting.

At the Royal Observatory, Greenwich, the highest reading of the barometer for the week ending June 23rd, was 30·04 in. on Monday evening, and the lowest 29·72 in. on Wednesday afternoon. The mean temperature of the air was 54·2 deg., and 6·3 below the average. The general direction of the wind was N.N.E. Rain fell on four days of the week, to the aggregate amount of 0·27 of an inch. The duration of registered bright sunshine in the week was 17·7 hours, against 14·4 hours at Glynde Place, Lewes.

For the week ending June 30th, the highest reading of the barometer was 29·91 in. at the beginning of the week, and the lowest 29·35 in. on Friday afternoon. The mean temperature of the air was 61·9 deg., agreeing with the average. The general direction of the wind was south-westerly. Rain fell on five days of the week, to the aggregate amount of 2·37 inches. The duration of registered bright sunshine in the week was 29·9 hours, against 34·1 hours at Glynde Place, Lewes.

For the week ending July 7th, the highest reading of the barometer was 29·88 in. on Sunday evening, and the lowest was 29·31 in. on Wednesday afternoon. The mean temperature of the air was 56·4 deg., and 5·2 deg. below the average. The general direction of the wind was south-westerly. Rain fell on six days of the week, to the aggregate amount of 0·90 inch. The duration of registered bright sunshine in the week was 18·8 hours, against 24·2 hours at Glynde Place, Lewes.

For the week ending July 14th, the lowest reading of the barometer was 29·50 in. on Wednesday morning, and the highest was 29·94 in. on Friday morning. The mean temperature of the air was 55·8 deg., and 7·0 deg. below the average. The general direction of the wind was north-west. Rain fell on four days of the week, to the aggregate amount of 0·44 of an inch. The duration of registered bright sunshine in the week was 23·2 hours, against 26·6 hours at Glynde Place, Lewes.

For the week ending July 21st, the lowest reading of the barometer was 29·26 in. on Monday afternoon, and the highest was 29·76 in. at noon on Friday. The mean temperature of the air was 59·4 deg., and 4·0 deg. below the average. The direction of the wind was variable. Rain fell on six days of the week, to the aggregate amount of 1·61 inches. The duration of registered bright sunshine in the week was 11·8 hours, against 10·7 hours at Glynde Place, Lewes.

For the week ending July 28th, the highest reading of the barometer was 29·73 in. at the beginning of the week, and the lowest 29·29 in. on Saturday morning. The mean temperature of the air was 60·3 deg., and 2·4 deg. below the average. The general direction of the wind was south-west. Rain fell on each day of the week, to the aggregate amount of 1·11 of an inch. The duration of registered bright sunshine in the week was 34·8 hours, against 22·2 hours at Glynde Place, Lewes.

For the week ending August 4th, the lowest reading of the barometer was 29·25 in. on Monday afternoon, and the highest 30·07 in. on Friday morning. The mean temperature of the air was 56·9 deg., and 5·8 deg. below the average. The direction of the wind was variable. Rain fell on five days of the week, to the aggregate amount of 4·29 in. The duration of registered bright sunshine in the week was 22·0 hours, against 23·1 hours at Glynde Place, Lewes.

For the week ending August 11th, the lowest reading of the barometer was 29·63 in. on Sunday morning, and the highest 29·98 in. on Monday morning. The mean temperature of the air was 63·9 deg., and 1·2 deg. above the average. The general direction of the wind was south-west. Rain fell on two days of the week, to the aggregate amount of 0·11 in. The duration of registered bright sunshine in the week was 47·5 hours, against 41·5 hours at Glynde Place, Lewes.

In September the isotherms run nearly east and west across England. The mean average temperature across Wigtown, Dumfries, and Jedburg is 55°; across Lancaster and York to Flamborough Head it is 56°; across Liverpool, Derby, Retford, and Lincoln, it is 57°; across Swansea, Monmouth, Reading, Hartford, and Ipswich it is 58°, and along the S. W., the S. and the S. E. coast it is 59°.

The rainfall differs almost in vertical lines from N. to S., being about 5 inches on the W. coast, about 3 inches in a vertical line down the middle of the island, and about 2 inches on the E. coast.

SCIENCE-GOSSIP.

THE sharks reported to be locating the mouth of the Mersey, to the great terror of sea bathers, turn out to be dog-fish.

A "PRIMER OF MICRO-PETROLOGY," by Mr. W. Mawer, is announced. This will be welcome news to many intending students.

M. E. L. TROUVELOT, during the storm of June 24th, at Paris, succeeded in obtaining the photograph of a flash of lightning, and submitted the proof to the Academy of Sciences on the 9th inst. This flash which seemed to connect the earth with a cloud subtending an angle of 40°. This flash appears divided in four main branches, brilliant and strongly marked. But there were others less visible, some so faint that they could not be seen in the negative without the help of a lens. The total number of the branches large and small is thirty-seven. A microscopic examination of the image of the flash shows that it is like a long ribbon, taking all the forms which a ribbon might present if plunged into a slowly moving liquid. This ribbon seemed to be traversed vertically by a multitude of rays more or less close together, and more or less brilliant. They are seen almost everywhere upon the flash, even upon its faintest ramifications. They correspond in general with the fracture of the zigzags which seem to make up the flash.

"NATURE" of August 9th, says:—A new gas possessing some remarkable properties, has been discovered by Professor Thorpe and Mr. J. W. Rodger, in the research laboratory of the Normal School of Science. It is a sulpho-fluoride of phosphorus of the composition PSF_3; and is termed by its discoveries thiophosphoryl fluoride. The best method for its preparation consists in heating pentasulphide of phosphorus with lead fluoride in a leaden tube. It may also be obtained by substituting bismuth fluoride for the fluoride of lead, the only difference between the two reactions being that the second requires a higher temperature than the first. Again, when sulphur, phosphorus, and lead fluoride are gently warmed together, an extremely violent reaction occurs, but if a large excess of the fluoride of lead be employed, a tolerably steady evolution of the new gas occurs, the excess of the lead salt appearing as moderator. It is an interesting fact throwing considerable light upon the constitution of the sulpho-fluoride, that it may be obtained by heating together to 150° C. in a sealed tube, as mixture of the corresponding chlorine—thiophosphoryl chloride, $PSCI_3$—a mobile colourless liquid and trifluoride of arsenic. The simple exchange of chlorine for fluorine here brings about a striking physical change, from a highly refracting liquid to a colourless gas; and now for the remarkable properties of the gas. In the first place, it is spontaneously imflammable. If it be collected over mercury, upon which it exerts no action in a tube terminating above in a jet and stop-cock, and the latter be slowly turned so as to permit of its gradual escape, the gas immediately ignites as it comes in contact with the air, burning with a greenish-yellow flame tipped at the apex with blue. If, however, a wide tube containing the gas standing over mercury be suddenly withdrawn from the mercury trough, the larger mass of gas with production of a fine blue flash, the yellowish-green tint being again observed as the light dies away. If a quantity contained in a tube over mercury be heated for a considerable time complete decomposition occurs; sulphur and phosphorus both being deposited upon the sides of the tube and gaseous silicon tetrafluoride left. From a spectroscopic examination, dissociation was shown to occur at the lowest temperature of the electric spark. The gas is slowly dissolved by water and appears to be somewhat soluble in ether; but alcohol and benzene exert no solvent action upon it. Finally, the colourless transparent gas was reduced to liquid somewhat resembling the sulpho-chloride, by means of Cailletet's liquefaction apparatus.

MR. W. T. BLANDFORD, F.R.S., announces the immediate publication of Part I. of his "Fauna of British India," including that of Ceylon and Burmah.

THE South Shields Literary and Scientific Society have started a new monthly, under the title of "The Tyneside Review." It is very brightly written and well edited.

WE are sorry to have to chronicle the death of Professor H. Carvill Lewis, a young American geologist who has made his mark even in British

geology, particularly in glacial geology. He had come over to England to pursue his studies on this subject, and to attend the approaching meeting of the British Association.

Parts III. and IV. of Mr. Howard Saunders' "Illustrated Manual of British Birds" are published, and fully maintains the high opinion we expressed about it at first.

We have received Parts I. and II. of Dr. Karl Russ' "Speaking Parrots," published by L. Upcott Gill. It deals with the diet, diseases, &c., of these birds, and is well illustrated.

The last number of the "Journal of the Geologists' Association" contains papers on "Pleistocene Land and Freshwater Mollusca," by B. B. Woodward; "*Elephas primigenius* associated with Flint Implements at Southall," by J. A. Brown; and on the "Influence of Geology on the early Settlements and Roads," by F. J. Bennett.

We have received a reprint of Mr. William Cash's important paper on "The Fossil Fructification of the Yorkshire Coal Measures," originally published in the "Proceedings of the Yorkshire Polytechnic Society;" also a reprint of Mr. A. Smith Woodward's "Synopsis of the Vertebrate Fossils of the English Chalk," from the "Proceedings of the Geol. Association."

MICROSCOPY.

Measurements by Camera Lucida.—Would you kindly reply through correspondents' column the following queries? (1) In measuring with the microscope by means of Camera Lucida. The books I have state that the distance from table must be 10" when the micro is horizontal. I presume that is if the distance between the object and the eye-piece measures 10"? (2) If I now pull the draw tube out 3" making the distance from object to eye-piece 13", I reason that I must raise the micro until it measures 13" from table, is this correct? (3) Roundly stated, should the distance from table (when micro is horizontal) not equal the distance between object and eye-piece in all cases?—*R. W.*

New Slides.—We have received a special slide of the Hessian fly (*Cecidomya destructor*), with illustrated descriptive sketch, from Mr. Fred. Enock. Mr. Enock has devoted special attention to the life-history of this notable insect, and has watched and noted every change from egg to egg again, and we believe it is his intention shortly to publish a full account of it. The "Journal of the Trenton Nat. Hist. Society" contains papers on "Freshwater Impressoria," by Dr. A. C. Stokes, &c.

New Method of Classifying Bryozoa.—Instead of depending upon exterior characteristics for classification, the bryozoa are ground into the required thinness and submitted to the microscope. The method of preparing these mounts is described in "Science" by Mr. A. F. Foerste. The specimen is ground on a Barnes' machine with emery till a plane is formed, having the same direction as the intended section. The successively finer grades can be made very fine indeed by using polishing powders sprinkled over a piece of plate glass. Then the specimen is carefully washed, dried, and glued with Canada balsam to the slide which is to retain the specimen. The specimen is then ground away until only a thin sheet remains fastened in the Canada balsam, after which it is again smoothed, washed and protected by a thin cover glass.

ZOOLOGY.

H. nemoralis var. scalariforme.—I have to record from this district a specimen of the rare shell *Helix nemoralis, M. scalariforme.* Mr. R. Stand, author of the "List of Lancashire Land and Freshwater Molluscs," paid a visit to this district in June, 1887, and called to see it, and pronounced it a unique specimen of that variety. Mr. E. Collier, of Manchester, called and saw this specimen, and pronounced it to be one of the finest that he had the opportunity of seeing.—*J. Russell Wildman, Burnley.*

Planorbis dilatatus.—A short time ago much interest was created among conchologists by the rediscovery of *P. dilatatus* in a pond at Burnley, and some theories were offered by Mr. T. Rogers, of Manchester, as to their probable introduction to Burnley. The ponds in which they were discovered were the feeding ponds to a paper-mill, and to the engines of a weaving shed, and their temperature is somewhat above the normal, which no doubt accounts for their being larger specimens than those obtained from the Gorton canal. The chief weeds in the pond are *Potamagun crispus, Anacrhais alsinastrum*, and a confervoid which grows on the sides and on the buttresses of the railway viaduct which crosses the ponds. I may say these are the ponds mentioned as "Margerson's Print Works," in Dyson's List, and it is doubtful whether they were to be found when that list of molluscs was written. Some months ago Mr. F. C. Long discovered them also in the canal which runs through Burnley, but the specimens were not so large as those found in the ponds. These also were found in close proximity to the return pipe from the condensers of the engines of a large spinning mill, and on examination of the embankment farther into the town, in some numbers, and also extending into the country for over a mile beyond the farthest mill, but in smaller numbers. When these shells were

discovered in the ponds, some speculation was made on their probable introduction, and Mr. J. Bates, who first noticed them particularly, had some correspondence as to their probable introduction. Their mode of distribution and their method of introduction to that particular pond was a little puzzling at first, as no cotton mill was within at least a quarter of a mile, and no visible connection with the canal or any river, until they were discovered in the canal (they had not been found in the canal prior to this), when their introduction could be accounted for by the action of the birds. This must have been some time since; as the district between the ponds and the canal is now built upon, and the canal is some considerable from and height above the ponds, and no doubt, being the nearest to the canal, and most suitable for the development of the ova, would probably have some influence upon them. I may say that the ponds are themselves nearly one hundred years old, as we can ascertain; but I think Mr. Rogers' theory of their introduction to England will no doubt account for their not being discovered prior to 1886. I may also say that *P. glaber*, *P. albus*, *B. Leachii* are also found in the pond. The nearest locality for the first species of the three is two miles away, and for the last no other place has yet been found, so there is plenty of scope for the various opinions upon this method of distribution of molluscs and plants.—*J. Russell Wildman*, 14, *Harghurst*, *Burnley*, *Lancashire*.

"BOOK-WORMS."—With reference to Mr. W. J. Simmons' article on "Book-worms," which appeared in your July number, it speaks of the paste used in binding as attractive to the insect, which, in the case of the present style of binding is true, but the ravages of the worm of the past were undoubtedly due to the wooden boards used so greatly for binding previous to the present century. My object in writing now, is to suggest a sure preventive against the present pest, and destruction, which binding is subject to in tropical climes, *i.e.* have all books bound in the best buckram, and have directions given to the binder to mix arsenic freely with the paste, and when covering the boards with the buckram, to paste it on, not glue it as is usual in that style of binding. The poison will retain its toxical properties, and not injure the appearance of the book. Trusting you will find room in your valuable paper for the above suggestions.—*A. B. G., Cambridge.*

NEW BRITISH EARTH-WORMS.—Mr. W. B. Benham writes to "Nature" (August 2nd) as follows:—"The occurrence of any new animal in England is a point of some interest, however humble that animal may be, and in order to work out the species of British earth-worms, I sent a letter to the 'Field,' some time back, requesting readers of that journal to forward me specimens. In reply, I received a large number of worms from various people, amongst them being M. F. O. Pickard Cambridge, of Hyde, who has very kindly sent me several parcels of worms. One of these parcels contained some very fine gravel taken from the bed of a stream, together with a number of small worms about one and a half to two inches in length. These turned out to be a species of Allurus, a genus formed by Eisen for a worm in which the male are on the thirteenth segment instead of on the fifteenth, as in the other genera of the family Lumbricidæ. Only one species is at present known, viz. *A. tetrædrus*; it is of a beautiful sienna colour, with a dull orange clitellum. I wish to record, for the first time, its occurrence in England; and also to draw attention to the fact that it lives in water, at any rate for some part of the year. Mr. Cambridge has been most obliging in giving me facts as to the place in which he found the worms; they occur in the gravelly bed of a stream which at certain times of the year runs down so low as to leave small gravelly islands two or three inches high. In these islands he found Allurus; but he finds none in the banks of the stream. We already know of Criodrilus as being a thoroughly aquatic earth-worm, living in muddy beds of rivers and lakes; and although this worm has not yet been recorded in Great Britain, I see no reason to doubt that it exists here. I should add that Mr. Beddard has informed me that he received a specimen of Allurus from Lea, Kent, some time after I received these from Hyde. It has been recorded also from Sweden, Italy, and Teneriffe."

A VERY rare fish, *Plagyodus* (*Alepisaurus*) *ferox*, has just been caught in the Karlsöfjord, in Iceland. It is 5 feet 9 inches long, with small shark-like fins, those on the back being about a foot in length. The head is pointed, and the teeth long and sharp. It appeared to lie asleep on the surface of the water, and a fisherman caught it by its tail, when it attempted to bite him. Professor Lüthen states that hitherto only three specimens of this fish have been caught, viz., one at Madeira, one in Greenland, and one previously in Iceland. It is believed that this is the mysterious fish, the fase-ál, *i.e.* the eel with a mane, of which the Faroe fishermen stand in such awe.

THE BOAR FISH.—I have read, in SCIENCE-GOSSIP for July, Mr. P. H. Gosse's account of the appearance of this rare fish at Babbicombe, and wish to add a few particulars that have occurred to me. The species is common to the Mediterranean, but a rare visitant to these shores. About eight or nine years ago it occurred rather plentifully on the Dorsetshire coast, but I have not heard of its appearance since, until this year, when I was staying in Guernsey at the end of the winter, and where it began to make its appearance at the end of March, though not in any numbers. But in May it began to arrive on the Dorset coast, and became so abundant in the middle

of the month that many hundreds were taken daily in the mackerel nets off Wyke Regis and Portland, many others being cast ashore in Weymouth Bay at almost every tide owing to what may be termed a suicidal instinct on its part. It comes sailing in with the tide in the usual vertical fashion, but on finding itself approaching shallow water, instead of backing seaward, it lays on its side and flaps itself in a line for the shore, where it becomes stranded. It is a handsome little fish, and when trapped in a rock-pool, as happened to me on several occasions, is a most interesting and beautiful study.—*J. T. Marshall, Sevenoaks, Torquay.*

BOTANY.

"ANNALS OF BOTANY."—The June part of this high-class work commences the second volume. It contains the following papers:—"Notes on the Plasmodium of *Badhamia utricularis* and *Brefeldia maxima*," by Arthur Lister; "On the Presence of Sexual Organs in Æcidium," and "A Monograph of the genus Calostoma," Desv. (Mitremyces, Ness), by George Massee; "On the Formation of Sugars in the Septal Glands of Narcissus," by E. Hamilton Acton; "On a Method of Studying Geotropism," by Anna Bateson and Francis Darwin; "On *Catharinea anomala*, Bryhn, a new British Moss," by J. Reynolds Vaizey; "On the Structure, Development, and Affinities of Trapella, Oliv., a new genus of Pedalmeæ," by F. W. Oliver. Also notes—"On the Systematic Position of Isoetes, L." by E. H. Vines; "Preliminary Note on the Development of the Root of Equisetum," by J. Reynolds Vaizey; "Pinus Monophylla," by Maxwell T. Masters. Most of the papers are illustrated in the highest style of book art. The second volume of the "Annals of Botany" promises even better things than the first.

BOTANICAL EXCURSION IN SWITZERLAND.—In SCIENCE-GOSSIP for July, p. 146, second column, line 37, for "left and right," read "right and left." Perhaps the error is not of sufficient importance to be noticed.—*J. F. Hamilton.*

WHITE FLOWERS.—It has always seemed to me that albinisms in animals, and white mutations of normally coloured flowers, were of more scientific interest than is generally supposed, so that of late I have been gathering notes bearing upon this question and its solution, with some hope of good result. At present, however, I will not enter into any theories on the subject, but merely appeal to those who meet with such to record them plainly and accurately for the benefit of other observers; and will now record two white-flowered varieties I have this year found in Custer county, Colorado:—*Iris missouriensis* form albiflora; flowers white, not uncommon with the type, at about 7,600 feet alt., but not seen higher, where the type is abundant. *Campanula rotundifola* form albiflora; flowers white, and in the specimen I found rather smaller than is typical. Found at about 8,500 feet alt., one plant. It will be noted that both these flowers are normally purplish-blue, and flowers of this colour seem unusually prone to have white varieties, while yellow flowers most rarely show them—a significant fact. Companula of normal colour will frequently fade white in drying.—*T. D. A. Cockerell, West Cliff, Colorado.*

MIMICRY IN PLANTS.—In hunting for plants the other day, I came across some specimens of *Geranium molle*, having not only their petals white, but their leaves also considerably blanched. These grew on a low dune in the lovely vale of Clarach, near Aberystwyth. A little farther inland, I noticed a specimen of *G. pratense*, with pale petals, growing on the encroaching sands. I attributed this change of colour to the barrenness of such soils. Cerastiums were absent.—*Geo. Rees, Aberystwyth.*

THE FLORA OF ANSTEY'S COVE.—There is probably no spot on the south coast which better repays the botanical explorer than this charming Devonshire cove, about two miles from Torquay. In addition to the loveliness and sublimity of the scenery, the rambler may meet with more rare and beautiful wild flowers there on a summer afternoon than he will find in other less favoured localities in a search extending over several days. My visit was made on the 2nd of August, when most of the plants I shall mention were in full flower. As one approaches the cove over the down, which extends to the edge of the cliff from the Torquay road, he finds its carpet studded with thousands of the blue blossoms of the autumnal squill (*Scilla autumnalis*). Thence he descends by a slippery stair of rough steps to the cove below, which is bounded by the sapphire sea on one side, and huge Cyclopean rocks on the other, clothed with green ivy and privet, while a beach of white pebbles, on which are huge masses of rock, surrounded by samphire, appears in strong contrast with the darker limestone above it. Close by, I first met with abundance of the lesser meadow rue (*Thalictrum minus*), the foliage of which at first sight somewhat resembles the maidenhair fern. Large patches also were to be seen of the very rare *Sedum rupestre*, with its golden stars, and the silvery flowers of *Sedum Anglicum*, unusually large and fine, also appeared at intervals, as did the yellow *Sedum acre*. Here, too, occurred in plenty and perfection the rare Portland spurge (*Euphorbia Portlandica*), with its tufts of lower leaves of glaucous hue, while the upper leaves and flowers were of livelier green. The next plant which caused attention was the white rock rose (*Helianthemum polifolium*), found only, according to Watson, in Somerset and

Devon. This was abundant higher up the glen; but was out of flower, as was also the sea cabbage (*Brassica oleracea*), with large racemes and pods. Among the masses of stone, the wild madder (*Rubia peregrina*) luxuriously winds its stems and spreads its prickly leaves in profusion, and on searching among the ivy, on its roots, I met with the find of the afternoon, *Orobanche hederæ*. It has a more lax spike than that of the *O. minor*, and its flowers are paler and were in some instances quite white. Two plants which I sought for, *Vicia sylvatica* and *Melittis melissophyllum* recorded from this place, I did not fall in with, from some reason or other. Again climbing the steep ascent, above which were whistling the bullets of the volunteers who were at practice, and listening to their "ping" as they struck the target, many more common but scarcely less interesting species were to be seen, such as, *Daucus maritimus*, *Carduus tenuiflorus*, *Geranium columbinum*, and *G. lucidum*, *Hypericum montanum*, *Linum angustifolium*, *Spiræa Filipendula*, *Cotyledon umbilicus*, *Silene maritima*, *Iris fœtidissima*, *Viburnum Lantana*, *Pyrus aria* in plenty, and *Arabis hirsuta*, rather sparingly. All the plants above mentioned, including *Ligustrum vulgare*, were undoubtedly indigenous. Time did not admit of the full exploration of the southern cliffs which are covered with shrubs, among which grew *Solidago Virgaurea* and *Inula Conyza*, and after a row across the placid waters of the cove, at sunset, in the direction of Berry Head, a pleasant return was made to Paignton.—*F. H. Arnold.*

NOTES AND QUERIES.

RUDIMENTS.—Ten months ago I started the question as to the appropriateness of Mr. Darwin's use of the term "Rudimentary."

In the course of the argument many other subjects of equal interest have been discussed, until the particular point at issue is likely to be overlooked.

To some of the readers of SCIENCE-GOSSIP, the question has appeared a "useless quibble," to others it savours of a want of "generosity or magnanimity," and yet, on looking over the remarks that bear immediately upon the subject, I am inclined to think that there is an underlying general feeling that a better word might be substituted.

Leaving alone, for the present, the question, as to the truth of the conclusion that the word "rudimentary" is meant to suggest, I return to the first question. Does the term express what it is intended to, in the "Descent of Man"?

Mr. F. G. Fenn, writing in the November number of SCIENCE-GOSSIP, allowed that "Darwin used the word rudimentary where many able anatomists and naturalists would now use vestigial."

Mr. T. Alfred Dymes, while defending Darwin's use of the word, himself suggests the mental substitution of "modified," "since," he says, "the desire to have the word altered seems to exist."

"T" who is jealous for the honour of Darwin's memory, and seems to fear that it is at stake, because of the possible misuse of a single term, has nevertheless himself substituted the word "vestigial" for "rudimentary" in the following quotation. "It is not needful," he says, "in these days, to demonstrate again, that the senses of sight, hearing and smell, in man are inherited in an enfeebled and *vestigial* condition." *

Why does "T" substitute "vestigial" for Mr. Darwin's "rudimentary," unless he too is conscious that the latter term is misleading?

Mr. A. G. Tansley, though disagreeing with the general drift of my last paper, recognises the objection to Mr. Darwin's use of the word "rudimentary," "on the ground that it is not used by him in the generally accepted sense," &c., and suggests, as a more appropriate word, either "reduced" or "degenerated." As the special object of my article was to challenge a defence of the word, and as no adequate defence appears to be forthcoming, perhaps it is useless to weary your readers further with the etymological phase of the question. But while rather a reluctant recognition of the inadequacy of the term "rudiment" has been obtained, none of your correspondents appear willing to allow that the machinery of the human organism (the brain excepted) is up to the "typical standard." An evolution of retrogression is cheerfully accepted as the gradual means by which man has arrived at his present physical condition, and on this poor "degenerate, enfeebled, reduced, modified, inferior, vestigial" instrument, his brain, which apparently alone has progressed, is to act, with this astonishing result, that he is "the most perfect animal known." The inconsistency of a brain that has progressed, being prepared to work an organism that has retrograded, appears to me most apparent.

It is like Mozart attempting to play on a worn-out lodging-house piano.

No one would have recognised Mozart if he had had nothing better to play upon, and the superiority of the human brain power can only be recognised through the instrument that it works.

Moreover, if we are to believe such an authority as Dr. M. Foster, it would appear that, of the two, the brain is even more dependent upon the machinery, than the machinery upon the brain, for the demonstation of its powers.

An animal from which the cerebral lobes have been removed can be induced to perform all the movements which an entire animal would be capable of, by means of the application of appropriate stimuli.

"The machinery," says Dr. M. Foster, "for all the necessary and normal bodily movements is present in all its completeness. The share therefore which the cerebral hemispheres take in executing the movements of which the entire animal is capable, is simply that of putting this machinery into action." Again he says, "The relation which the higher nervous changes concerned in volition bear to this machinery is not unlike that of a stimulus. We might almost speak of the will as an intrinsic stimulus. *Its operations are limited by the machinery at its command.*"

With such statements of fact before us, it is difficult to see why "it is absurd to import into the question the phenomena belonging to the mind," as your correspondent "T" declares it to be.

In conclusion I would repeat, that arguing upon evolution ground only, should I compare the organs of different classes of animals one with another, to find the greatest degree of perfection: for while comparative anatomy has revealed to us the unmistakable family likeness running throughout creation, it does not necessarily follow that we are justified in making

* The inverted commas and italics are mine.

invidious comparisons between organs specially adapted to differing purposes. Nevertheless, the evolution theory has so accustomed us to the use of such terms as "higher and lower forms," "progression and retrogression," that in order to answer the evolutionist, he must be met on his own ground. It might be more correct to deny the existence of a "typical standard" by which the organs of animals, whose environment differs, could be measured, but since such standards are claimed to exist, it is most reasonable to look for them in man. But your correspondent Mr. Tansley has out-Darwined Darwin, in asserting that "the muscles of our arms and chest . . . have fallen away from the typical standard exemplified in the lower animals," for while I am quite ready, as he supposes, to admit that they are "more perfect" in man than in the gorilla, I cannot do better than quote Mr. Darwin himself in support of my belief.

He says, "Although the intellectual powers and social habits of man are of paramount importance to him, we must not underrate the importance of his bodily structure . . . . To throw a stone with as true an aim as a Fuegian in defending himself, or in killing birds, requires *the most consummate perfection* in the correlated action of the muscles of the hand, arm and shoulder, and further, a fine sense of touch."

When any quality surpassing this "consummate perfection" is to be found in the structure of the gorilla, then only need we look upon it as the typical standard from which we have fallen.—*Nina F. Layard.*

Ground Ivy.—While searching for orchids the other day (June 23rd) my interest was aroused by observing a curious appearance in the above plant. A large quantity of ground ivy I noticed as having a remarkable growth in the leaves, one at least on each stalk having a substance about the size of a small cherry, apparently growing out of the leaf. On examining and dissecting one, I found the growth to be a kind of gall, consisting of an outer case of a substance resembling the rind of an apple, then a kind of spongy or woolly material, and finally a cell containing a minute maggot. Some of the galls had two or three cells, containing the insects, and appeared as if double. Can any one tell me if this is common to the plant, also the name of the parasite? I may add, every plant I noticed in the immediate vicinity of those first examined were afflicted in the same manner, while those in other places were free from the insect.—*F. H. W.*

Yew-Trees, their Size and Age.—Since the correspondence on the above subject has come forward, I thought I would measure a fine old yew in the churchyard at Much Marcle, Herefordshire. I find the circumference at a distance of about 6 ft. from the ground, to be 25 ft. 5 ins. This gives a diameter of 8 ft. $1\frac{1}{22}$ ins. (taking $\pi = \frac{22}{7}$) or 1164 lines, indicating an age of 1164 years. I must not forget to say that the tree is hollow, and there are seats inside. Now should the width of this opening be taken into consideration in measuring the circumference? In other words, has the fissure been caused by a rent or by the removal of a portion of the tree? I think most probably the former. This supposition will, of course, considerably reduce the age of the tree.—*Chas. A. Whatmore, M.C.S.*

Natural History Notes.—The following notes might be interesting to your readers. On the 3rd of June I took a freshly emerged specimen of *Colias edusa*. Isn't this very early for the appearance of this butterfly? On the 8th July I passed a garden with a good quantity of ferns growing in it, and all of them except a few—viz. *S. vulgaris*, *O. regalis*, and *A. nigrum*—had the ends of the fronds branching out. Can any correspondent account for this phenomenon, as there was no peculiarity in the position, except that they were facing the north?—*E. E. Lowe.*

Dissolving Gum Tragacanth.—In your book "Notes on Collecting and Preserving Natural History Objects," at page 133, you mention the Gum Tragacanth being dissolved in gum arabic. I find some difficulty in getting the former to assimilate thoroughly. Can any reader please state what I can add to cause it to do so? I may say that it proves satisfactory, excepting occasionally, when a rather large piece comes up, and that generally when one wants it to be the opposite, for mounting such a plant as one enclosed.—*J. F. H.*

The White Rocks of Castille and Red Rock of the Moselle.—"The way to Heaven is as near, if not nearer, from Syria as from England, or my native Spain," remarked the Queen of Charing, piqued with our proverbial climate; and if ever creation dawned in a transparent, dry and elastic air, you may breathe its enchantment when the constellation Virgo sheds its influence on the corn-land of Castille. Wildly magical and full of light is then the silent night; the Milky Way glitters around like a diamond cincture, and angels appear to descend with burning torches and jewelled crowns to gather in the golden ears. When the sun arises, flowers the most urbane gleam like tinsel over this tree-less waste of limestone and sand, white and sparkling as wedding-cake paste; and heated by the glow, they exhale delicate aromas that the same species seem quite to want in our damp, northern air. Roots out of dry ground, they one and all are adapted to the parched soil, in being woolly or wiry, or soft, fleshy and glandular, and thus they live on and soak in from the dews the nourishment denied to their rootlets. You may notice this in the mealy composite, *Chondrilla juncea*, in the flesh-coloured Jerusalem sage (*Phlomis*), in the purple sandworts full of colour, in the yellow thistle (*Scolymus hispanicus*), in the wiry stalks of the annual tansey, dwarfed pinks, and stonecrops, or even in the downy and inconspicuous *Holosteum umbellicum* too easily mistaken for a plantain. The very stalks of the buck's horn plantain appear here a trifle more woody and tough. But among the loveliest of Castillian wild flowers, the frail blue pimpernel shuns the drought and bathes its beauty in the perpetual freshness of the river bank; strange too, for with us these are also flowers of the corn-field though impatient of the shower. The gutta-percha hills and steppes that arise out of these shining plains resemble so many icebergs; and when the dust drives along their summery vines in smoky puffs, they present the dreary appearance of eternal frost. Everything on their slopes is then crisp and candied as if encrusted by a petrifying spring; the scorched grass, flowers, flies, and grasshoppers, are alike liveried in silvery white. The Chalk Hill blue butterflies (*Polyommatus corydon*) are indeed so large and white as they come dashing along the road as to be perfectly unrecognisable; and *Polyommatus dorylus*, only to be distinguished in the shadows from the common blue by a cerulean flash, and only differing in the absence of two spots at the base of its fore wings, trust we Professor Leller, is often to be seen abroad in similar disguise. Here, however, the change is structural, for the wing scales are newly adorned with yellowish white. True it is that on chalk and limestone most of the butterfly and moth

kind are naturally paler, and here garden flowers often turn suddenly white, and so should it be in Castille. I have tracked these tranformation Chalk Hill blues from Valladolid to Valencia, but on entering on the damp mountains of the Asturias, that act like a sponge in sucking in the Atlantic clouds and clarifying the Castilian air, I noticed that they there wore their usual blue dress. Hence it is evident that dry calcium is a bleaching powder; and there is a reason why the pale hills should be populated by forms so wan. Let us now turn to the iron tonic. Is any moon-struck lover desirous to taste the love philter of the Syrian damsels, let him take a railway-ticket to Treves previous to a July thunderplump. The Moselle is creeping along, low in its channel, brick-red and lurid. The purple clouds are mirrowed red, and the strip of intense blue between reflects laky purple. Beneath the red rocks he will start to see its maternal bosom curdle as with clotted gore. The blood-drops of Adonis are dripping on the purple floss of the *Geranium sanguineum* and trickling down the sticky stems of the *Silene armeria*: and from the bosky ravine Cupid in giddy chase leads forth the queen of loveliness riding the sly-eyed boar. No, the slant sunbeam fades, and it is the all indelible blood of the Theban cohort that mantles there, and the little Christian maiden leaps and screams—*erschrecklich.* Slow echoing up the valley growls the thunder, beneath the red rocks the current turns blue and pure, but on the opposite bank it swerves among the lean bluish barley, red and more turbid: and now the deluge is sweeping down in its strength, no longer red, but yellow and sparkling as *Moselle mousseux.* Let us walk up this acacia-scented shade and observe how Nature paints her colours on rocks so red and soluble. There is a glow around, and the white and zigzag clovers have a rosy hue; but brown, and black are evidently here in fashion. The bramble stems have a look of porphyry, and a company of escargots (*Helix pomatia*) crawling on the wet bank carry shells as brown as chestnuts. The black and brown butterflies are all most unusually black, and something akin to ink blots and inks in their wing patterns. Our manufacturing towns change the white moths in their vicinity into blackamoors, and iron oxide and vegetable acid make ink; and could we bottle an extract of native soil we might create varieties at pleasure. Stay, my friend, in practice I have never produced much effect on living things by a use of inorganic chemicals; Nature is wiser than I, and her love philters are more potent.—*A. H. Swinton.*

THRUSHES' NEST ON THE GROUND.—Whilst rambling in the neighbourhood of Dromore, co. Down, lately, I discovered a fine thrushes' nest with four eggs, situated in long grass on the ground. It was near a river, and close to a shrubbery. I should like to know if it is unusual for thrushes to build on the ground.—*F. J. Bigger, Belfast.*

BEFORE DARWINISTS WERE METAMORPHOSISTS.—It is pleasant to think that in the middle ages Rochester Priory possessed its Book of Flowers and its description of Noah's Ark, and to learn that monasteries equipped their divines and metamorphosists as well as their knights of the sword, for to them was entrusted the formation of language and ideas which mould themselves with difficulty to the age. The maiden of sweet seventeen who has watched the alkanet drop its sad bells one by one in the shadows, and who has striven to think that flower of blue was once the athlete Hyacinthus killed by a quoit, will readily pardon the helpful monk who bethought him to supplement the grand fiats with some small compliancy on the part of the nature herself drawn from so dreamy a source; for poor man, great in Genesis and the Classics, museums and microscopes, had never conjured up a phantom of Darwinism to expound that a dull order was Heaven's first law. Thus the writer of the Natural History, 1270, alphabetically arranged, after prefacing an arbitrary idea of the creation of man borrowed from the Latin, proceeds to describe the animals, birds, sea and river animals, reptiles, fish and insects, in groups as the Biblical idea directed; beginning otherwise methodically with A is the ass, and including among his freight of two hundred and eighty, or thereabouts, Pegasus and the Phenix. Yet the transaction is not wholly incurious, since the social ways of the beavers in the forests of Poland, according to Jacob, appears drawn from life, while the proclivities of the boar and bear in Germany are detailed with a gush and gastronomic relish. For the same reason, an enquiry as to the origin of Perpetual Motion in a Prime Mover of Infinite Power, inspired the logician of those days with an uncomfortable notion of stupendous violence since none had pushed generation to its limits and observed the working of the great in the infinitely little. Who will not allow that Darwinism is an advance on the score of integrity?—*A. H. Swinton.*

NOTES ON HYBRID ZEBRAS.—Mr. Tegetmeier has communicated to the "Field" the following account of a very interesting experiment on the breeding of hybrid zebras, and their fertility or sterility, which is in progress at Theobalds, the estate of Sir Henry Meux. "Some few years since, a very fine female specimen of Burchell's zebra (*Equus Burchelli*) was obtained from the Zoological Society, and turned into the park in company with a herd of ponies. Burchell's zebra, I may state, is the species most frequently captured, and by far the most in Zoological collections. It is an inhabitant of the plains, the other species dwelling in the mountainous districts of South Africa. Contrary to general belief, the zebras are tamed without difficulty, if proper treatment is adopted towards them. On going into the park at Theobalds, I was cautioned against approaching the zebra; but, having confidence in my power of making friends with animals, I quietly walked up to her when grazing, took care not to alarm her, and was leaning on her withers and patting her off side in a couple of minutes. In fact this zebra is much more docile than the two fillies of which she is a parent. The eldest of these, rising three years old, was sired by one of the ponies in the park, and shows the stripes of the zebra only to a moderate degree. The other, and by far the finer filly, a yearling, the produce of a half-bred trotting pony, imported, I believe, from the United States of America. This yearling is beautifully striped, not only on the legs and neck but also on the haunches. As they have not been handled they are rather skittish, having a good allowance of corn along with the working ponies, all of which are in admirable condition. There should be no difficulty in breaking in these two fillies to harness. Many of my readers must remember two hybrid zebras belonging to the Zoological Society, that were formerly driven about town tandem, in a light cart. They were as docile as any ordinary horses; and with judicious treatment, there is no doubt these two fillies would be equally amenable to gentle and judicious discipline. Ordinary mules are characterised by great nervous excitability, and my friend, Mr. C. L. Sutherland, is always insisting on the necessity of accosting mules with gentleness, so as to avoid startling them. He main-

tains that what is generally regarded as obstinacy and perversity, arises in most instances from nervous excitement. I can testify that, in the numerous mules I have seen for about a score of years in his stables, I have never seen one vicious or obstinate. Doubtless these hybrid fillies would partake of the mule character, and require gentle handling and careful treatment to break them in satisfactorily. It is essential that an animal should acquire confidence in man. Another point of some considerable interest may possibly be determined at Theobalds—namely the fertility of the hybrids. These two fillies are now running about almost in a state of nature with a troup of ponies, they are well fed, and are under such conditions that their fertility, if it exists, may be demonstrated. The experiment of trying to breed from them from an entire pony is one of considerable interest, and whether it prove successful or otherwise will add a definite amount to our knowledge of the constitution of these hybirds."

Bees and Jubilees.—Some of your readers may recollect the bees which White, in his Natural History of Selborne, mentions as having their home in his time (now probably a hundred years ago, as he died in 1793), on the summit of Mount Carburn, near Lewes, in this county (Sussex). I visited the spot a few days ago, but I could not see a single bee or any appearance of bees, work there. Seeing a shepherd at a short distance, I went to him and inquired whether he knew anything about the bees I was looking for. He said, "Oh, yes! I have often been driven away from the top of Carburn by them, but the Jubilee fire did for them, for I have not seen one since then." So that it would appear that this colony of *Anthophora acervorum* is now extinct. The site of this colony covered a very small space of ground, and no doubt the fire which was of huge dimensions consumed all the mature bees then and there and baked all the eggs, larvæ and pupæ that were underground. It would appear, therefore, that even Jubilees have their drawbacks, for that of last year was the occasion of the destruction of a colony of insects that may be said to be historical, and which though now destroyed, will certainly live for ages yet to come in White's delightful "History of Selborne."—*R. B. P.*, *Eastbourne.*

Mr. Ruskin's Museum at Sheffield.—Half a dozen years have passed since Mr. Ruskin offered to Sheffield all his art-treasures, providing the town would find a suitable building for their preservation. He even went further in his spirit of munificent liberality by undertaking to personally superintend the arrangement of the objects in the Museum, and be responsible for its management during his life-time. It was proposed that the new building should be built at Endcliffe, one of the most beautiful spots within the boundaries of the old town. Money was not wanting; £10,000 were subscribed; plans were prepared, and the design was admitted by Sheffield experts to excel anything they had thought possible. Then an irritating obstacle occurred. Matter-of-fact municipal magnates intervened. They did not understand the nature and purposes of the St. George's Guild, and distrusting its continuance, made it a condition of subscription that the Museum should be satisfactorily guaranteed to Sheffield for ever. Technical difficulties arose as to the title and the nature of the guarantee that the Museum should remain the inviolable and permanent possession of the town. Mr. Ruskin has a scornful contempt for superficialities, and he cannot bring his mind down to legal hair-splitting. He declined to read any further lawyers' quibbles, and his indisposition left the matter in abeyance. It is satisfactory, however, to know that the settlement of the whole question will no longer be delayed, and that soon the new building will arise in all its fair proportions. Mr. Ruskin has deputed the trustees to cut the Gordian knot by telling the lawyers to draw up a conveyance between the Mayor and Corporation of Sheffield and the St. George's Guild. The pictures and objects, as well as the building, are to remain the property of the public for ever. The new Museum will be a splendid memorial to its founder, and a permanent embodiment of his ideas. May he long be spared to advise in all its counsels and to direct its resources.—*Edward Bradbury*, in "The Magazine of Art" for August.

The "Spectre of the Brocken" on Snowdon.—During an ascent of Snowdon on July 5th two friends and myself witnessed the strange phenomenon known as the "Spectre of the Brocken." We left our tents near Lake Ogwen in heavy rain and crossed Tryfaen and Glyder Fach in thick mist, dropping down on Pen-y-Gwryd Hotel for refreshments. The mist still hung heavily on Snowdon, but we determined to try the ascent by the Crib Goch Ridge. About 7.30 P.M. the mist lifted to the west, revealing a magnificent view seawards, while the Crib Goch glowed red in the sun's level rays. Our shadows, enormously magnified, suddenly appeared on the dense bank of fog to our left, encircled by two concentric rainbow rings. The shadows would be about 50 feet high and the outer ring fully 300 feet diameter. Every movement we made was faithfully represented, and by standing together the three shadows were produced in one circle. This curious sight occurred four times in forty-five minutes, disappearing only when the mist obscured the sun.

Ipomœa, &c.—In his "Tour Round My Garden," quoted by Julie Hodgson (Science-Gossip, p. 166), A. Karr means evidently *Ipomœa pupurea*, L. It is frequently sown round houses and windows, and its flowers close early in the morning. Their popular names are volubilis and sometimes liseron, though this is rather *Convolvulus sepium*. The original text says "volubilus" in the first passage, and "liseron" in the second.—*C. C. Doullens*, *Somme.*

Preserving Bats.—Could any reader of Science-Gossip give me instructions how to kill and preserve a blind bat?—*John J. Holstead.*

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.

H. E. Jones.—The best and cheapest polish that would bring out the structure of an already worn pebble would be common coach varnish.

G. A. G.—Thanks for the specimen of white *Geranium Robertianum*. It is, however, of not uncommon occurrence.

A. Howes.—The "Selborne Society" publish through Elliot Stock, from whom you may get the address.

A. Pittis.—The caterpillars reached us in such a shrivelled-up condition that it was quite impossible to identify them.

T. G.—Get "Notes on Collecting and Preserving Natural History Specimens," edited by J. E. Taylor, published by Messrs. W. H. Allen, price 3*s.* 6*d.*

C. H.—You will find Adams' "British Birds and Their Eggs" useful. The coloured plates are well done, and will help you. Montague Brown's "Manual of Taxidermy" will give you all the assistance you require.

Dr. FORBES (Leith).—Many thanks for the coloured photograph of the dodo, and your kind and generous remarks.

A. W. HARRISON.—Consult Sir Robert Balls' "Story of the Heavens," also Skertchley's "Physical History of the Universe."

EXCHANGES.

Ancylus fluviatilis, Planorbis glaber, P. albus, P. spirobis, P. dilatatus, Physa hypnorum, Helix nemoralis, H. hortensii, H. arbustorum, H. aspersa, Pupa umbilicata, and Anodon cygnea, in exchange for land, freshwater and marine shells, or fossils.—Albert Walton, 44 Canning Street, Burnley.

CAN any conchologist oblige me with a couple of specimens of *Helix obvoluta?* I will send in return twenty species of shells from neighbourhood of Burnley.—Francis C. Long, 8 Cog Lane, Burnley, Lancashire.

WANTED, foreign shells (not British) in exchange for land, freshwater, and marine shells from the vicinities of Port Elizabeth and Algoa Bay. Lists exchanged.—John Farquhar, 33 Upper Hill Street, Port Elizabeth, Cape Colony.

WILL exchange eggs of rook, hooded crow, crow, pheasant, moor hen, partridge, sand martin, landrail, common sandpiper, jay, magpie, redpole, tree sparrow, yellow ammer, garden warbler, chaffinch, greenfinch, wry neck and red-backed shrike, for natural history specimens, star-fish or echini preferred—not necessarily British.—Hugh B. Preston, 54 Lexham Gardens, Kensington, W.

WILL exchange 140 Ceylon bird skins, prepared for mounting, and quantity of ant live larvæ, for other natural history objects.—Dr. Clements, 3 Prospect Road, Chatham.

DUPLICATES.—*P. albus, P. carinatus, P. spirobis, Physa hypnorum, Lim. truncatula, Z. glaber, Z. nitidus, Pupa umbilicata, C. tridens, C. lubrica,* &c.—Wanted, *Pis. nitidum, Z. excavatus, H. aculeata, H. concinna, Balia perversa.*—F. C. Long, 8 Cog Lane, Burnley, Lancashire.

OFFERED. — Leeuwenhoek's Works on the Microscope, 2 vols. in 1, date 1800; "Baker on the Microscope Made Easy," 1769; and parts 1 to 20 inclusive of Dr. M. C. Cooke's "Grevillea," in exchange for vols. of SCIENCE-GOSSIP for the years 1872 to 1877 inclusive.—Dr. Webb, 2 Brougham Terrace, West Derby Road, Liverpool.

WANTED, supplement only to "Wood's Index Testaceologicus."—C. L. Smout, 8 Trinity Street, Hastings.

SHELLS from the north London district in exchange for *S. ovale, S. lacustre, P. fontinale, P. pusillum, P. nitidum, P. roseum, U. margaritifer, U. pictorum, B. Leachii, V. cristata, P. lineatus, P. nitidus, P. nautileus, P. glaber, P. dilatatus, P. hypnorum, L. glutinosa, L. glabra, A. lacustris, V. pellucida,* various species of zonites, *H. arbustorum, H. concinna, H. hispida, H. sericea, H. revelata, H. fusca, H. pisana, H. rupestris, H. pulchella, H. obvoluta, B. montanus, P. ringens, P. umbilicata, P. marginata,* various species of vertico, *C. Rolphii, C. biplicata, C. tridens, C. lubrica, A. acicula, C. minimum,* and *A. lineata.*—J. W. Williams, M.A., D.Sc., 51 Park Village East, London, N.W.

WANTED, larva of *Ocellatus caga* and *Quercus ligustri;* will give in exchange various lepidoptera, preserved larva, dispar, coleoptera, or No. 1 of Lang's "Butterflies of Europe." List sent.—Walter Copley, 17 Clough Terrace, Sowerby Bridge.

WANTED, to exchange plants for herbarium; correspondence invited.—E. C. Angel, 4 Saville Row, Bath.

OFFERED, ¼-plate camera and lens, two double slides, stand and two vulcanite developing dishes. Wanted, micrographic dictionary.—R. Williamson, 137 Ardgowan Street, Glasgow.

ANIMAL hairs for micro mounting. About twenty different and interesting kinds used in the textile manufactures, in exchange for rare British or foreign birds' eggs or skins.—H. B. Booth, 25 Northfield Place, Manningham, Bradford, Yorkshire.

WILL exchange, in sets or separate, eggs of merlin, ruff, cuckoo, kingfisher, nightjar, &c., for warblers, jays, hawks, landrails, tits, finches, buntings, owls, plovers, crows, and many others.—Jas. Ellison, Steeton, Leeds.

OFFERED.—Clutches of kestrel, S. hawk, dipper, stonechat, grasshopper, warbler, chiffchaff, goldcrest, and tomtit, corn and reed buntings, lesser redpoll, bullfinch, rock dove, common sandpiper, oyster-catcher, heron, mute swan, cormorant, kittiwake, great black-backed and herring gulls (nests with several), eggs of guillemot, razor-bill, puffin, gannet, manx, sherwater, storm petrel. Please describe clutches offered in exchange for above.—R. J. Ussher, Cappagh, Lismore.

H. cantiana in exchange for other land and freshwater shells or fossils.—W. Crossley, 15 Barker Street, Cornholme, near Todmorden.

ABOUT fifty species of marine algæ, in exchange for rare marine, land and freshwater shells. Also stamp album (back rather damaged), containing about 400, many rare varieties, in exchange for marine, land and freshwater shells.—John Jos. Holstead, 19 Millholme Terrace, Upperby Road, Carlisle.

OFFERED.—"British Moths" (Duncan), with 30 coloured plates; "English Folk Lore" (Dyer). Wanted.—Bentham's "Illustrations of British Flora."—I. Smith, Monkredding, Kilwinning.

P. glaber and *P. dilatatus* in exchange for other British or foreign land, freshwater or marine shells.—W. Dean, M.C.S., 50 Canning Street, Stoneyholme, Burnley, Lancashire.

SHELLS, coins and fossils in exchange for British or foreign butterflies or moths, named and set.—F. Stanley, M.C.S., 6 Clifton Gardens, Margate.

WANTED, larvæ or pupæ of any of the larger British or foreign lepidoptera, in exchange for British marine, land or freshwater shells, or English coins.—F. Stanley, 6 Clifton Gardens, Margate.

FINE specimens of *H. nemoralis* and *H. ericetorum* from Portrush, co. Antrim, Ireland, in exchange for good varieties of the same from other localities, or *H. pisana, Cantiana cartusiana, Fusca lapicida, C. Rolphii, L. auricularia,* &c.—T. H. Hedworth, Dunston, Gateshead.

FIFTY-FOUR species of British butterflies, including iris, artaxerxes, swallow-tails, frittilaries, vanessas, hairstreaks, blues, and many others—some very rare and valuable, in exchange for British birds' eggs. Send lists with desiderata to—A. Hollis, St. Johns, Antony, Cornwall.

OVER 100 species of well-preserved shells from the Paris basin chalk, in exchange for shells and fossils from the British Isles. Lists exchanged.—Monsieur Bonnet, 9 rue Mazagran, Paris.

WANTED, June gatherings of *Pleurosigma angulatum, estuarii, fasciola, formosum, elongatum, lacustris, Spencerii, Parkeri, curvulum,* &c., in good quantities. Will give in exchange fine deposits, either prepared or raw, Oamaru, Simbirk, Springfield, and others. — J. Tempère, 168 rue d'Antoine, Paris.

Helix hæmastoma from India, and *H. cantiana.* What offers? Also some old curios. List sent.—Archibald Hy. McKean, S. Denys, Southampton.

WANTED, a good gathering of *Volvox globator;* a good exchange will be given in micro slides.—S. L., 15 Horton Lane, Bradford.

DUPLICATES, L. C., 8th ed.—5*a*, 39, 40, 41, 81, 82, 176, 291, 317, 366*b*, 372, 479, 494, 505, 543, 576*b*, 639, 680, 835, 859, 865, 873, 901, 910, 940, 944, 954, 966, 973, 1043, 1270, 1344, 1346, 1475, 1545, 1550, 1563, 1756.—J. A. Wheldon, High Ousegate, York.

BRITISH and foreign birds' skins in exchange for others, or eggs.—S. L. Mosley, Beaumont Park, Huddersfield.

DUPLICATES. — *Pterostichus picimanus, Auch. oblongus, Scistus ferrugineus, Hydræna nigrita, Cistila murina, Leptura livida, Saprinus maritimas,* &c. Desiderata.—Numerous species for types.—W. H. Bennett, 11 George Street, Hastings.

WANTED, student's microscope. Offered, Matthew Henry's "Commentary," complete, 6 vols. (folio), and other books.—S. E., 4 Padua Road, Penge.

WANTED, many species of birds' eggs, particularly clutches with data. Offered, British lepidoptera.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WANTED, books of travels, especially scientific; also general natural history books. Lepidoptera, eggs, shells, &c., offered in exchange.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

BOOKS, ETC., RECEIVED.

"Smithsonian Report" (1885).—The Cathic Gallery" (Washington).—"The Bacon-Shakspere Question," by C. Hopes (London: T. G. Johnson).—"Proceedings Liverpool Geol. Soc."—"Journal Royal Microscopical Soc."—"The Microscope."—"Scientific News."—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News"—"Wesley Naturalist."—"Victorian Naturalist."—"Journal of Conchology."—"Cassell's Technical Educator."—"Life-Lore."—"Research," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: R. C.—A. P.—L. C.—J. W. W.—T. B.—H. B. P.—J. B.—W. S.—J. R. W. C.—L. S.—W. C.—E. C. A.—F. C. L.—G. H. W.—J. F.—I. F. H.—P. F. G.—R. B. P.—W. G. C.—J. S.—I. D. A. C.—A. H.—A. W.—C. C.—J. J. H.—I. F. H.—W. M.—R. J. U.—W. D.—J. E.—W. C.—W. B. B.—F. N.—R. W.—A. B. G.—A. H.—G. R.—T. H. H.—H. E. J.—F. S.—D. W. B.—S. T.—F. H. W.—E. W.—S. L. M.—W. H. B.—E. E.—D. A. W.—G. G.—J. I. R.—A. S.—A. H. M. R.—W. W.—J. T. M.—W. K. M.—W. H. B.—J. B. B.—A. P.—G. D.—C. H.—C. L. N.—E. O. R.—W. J. S.—K. P.—D. J.—A. W. H., &c. &c.

A NATURALIST ALL AT SEA.

By C. P.

[*Continued from page* 199.]

IT was in the Blue Mountains that I first saw parrots in their wild and natural condition. It was after a severe thunderstorm at Katoomba; all bird-life seemed exceptionally restless. A flock of parrots came up from the fastnesses of the forest — 1000 feet below in the valley. They were chiefly Rosellas and Lories, brilliant enough in plumage, but foolish and discordant birds. They rested on the telegraph wires or among the branches of gum-tree, utterly regardless of our presence; sitting to be stared at with field-glasses, with all the *sang-froid* of a dowager in her opera-box. But, for my part, I would rather see a parrot in a cage —and hear him swear—than have them in native wildness, there is an incongruity in such garish colour and clatter. On board the "Oceana," returning home to England, we had a splendid collection of living parrots and cockatoos, the property of various passengers. I had ample opportunity of comparing the various Australian species. Besides the yellow crested cockatoo (*C. galerita*) there was the attractive Leadbeater's species (*C. leadbeateri*), white with tinges of red in the breast, and at the base of the crest. But, perhaps, the finest of all was a nearly black fellow of great size. I think he is known as the Funereal cockatoo. Besides these we had the pearl-grey little parakeet cockatoo, rosellas, love-birds, grey parrots with rose-coloured heads, white parrots with blue eyes and breast dashed with crimson, with numerous green and yellow and blue species.

Mr. Etheridge showed me at the Museum in Sydney a tame dingo, a somewhat uncommon specimen; their nature is treacherous, and even with this young dog nobody but his master could safely touch him. In appearance it reminded me of a lean Colley with the startled ferocity of the wolf; the colour being tawny yellow, shading to brown on the back. Of course this animal is one of the few non-marsupials of Australia. There is now ample evidence of its existence back into prehistoric ages; bones occur in caves of Pleistocene period.

There is a fine series of kangaroos in the Melbourne Zoological Gardens, ranging from the smaller Wallabys to the giant "old men" species, the specific distinctions appeared to me terribly puzzling; in fact, the chief variation appears in size, colour and habit, rather than structural change; the intermediate gradations are wonderfully close.

I saw an echidna burrowing in the ground, the porcupine-like bristles of the back only visible above ground; the platypus I saw only in a pickle-tub, and the eggs preserved in spirits—perhaps half the size of pigeons'-eggs. In the Melbourne gardens a couple of the so-called bears reposed peacefully in a gum-tree. I do not suppose they would attack a flea. No protection is needed, so they have liberty sufficient to clamber from tree to tree; as a matter of fact they never seem to move, they are very small, with grey-brown fur.

The most attractive spot I traversed in the Blue Mountains was Nellie's Glen, a stupendous ravine hardly less than a thousand feet in depth. Here noble tree-ferns afforded a welcome shelter, Hymenophyllum and various small ferns covered the face of the moist rock. Large yellow-breasted robins flitted overhead and the irresistible laughter of the jackass, hidden away in the tall gums or wattles, compelled us to join in his merriment.

Gigantic ants scurried here and there. One large black fellow, solitary in habit, carries a massive pair of jaws, but fights only when disturbed. He is known commonly as the "policeman or bull-dog ant" because he separates the "soldiers," a fierce and warlike tribe with red bodies; the latter have uncontrollable fits of passion. Tickle one with a stick, and he will simply lie on his back kicking with fury. Beware how either species touch the skin. I am informed that the sting or bite is intensely painful, like the touch of a hot iron. But there is a more extraordinary species still in Queensland, called the meridian ant; the hillocks erected by them are several feet high, but remarkably thin. Passing in the train they have the appearance of so many tombstones. The strange thing is, each one is erected due north and south; they never vary from this position.

Small white ants (Termites, I suppose,) I saw at work in a gentleman's stable, near Sydney. They had ruined the coach-house, in spite of constant petroleum dressing.

In Melbourne I had the good fortune to receive an invitation to the conversazione of the Field Naturalists' Club, and was fairly amazed at the evidence of work accomplished in all branches of Natural History. The collections and groups of birds alone repaid us for the evening expedition. A crimson-breasted specimen of *Columba superba*, a pair of frontal tit-shrikes, rifle-birds, regent-birds, and many others dwell in the memory; while the variety of robin is quite bewildering. Flame-breasted, crimson-headed, yellow-breasted, grey-throated, hooded robin, pink-wood robin; and I believe this does not complete the list of the New South Wales species.

When the club organise an expedition in holiday time, they simply start off for a week or so to some spot hardly known to naturalists, say an island, perhaps ten times as large as the Isle of Wight. Here they camp, shoot and hunt, collect unknown treasures from the sea-shore and botanise inland to their hearts' content. It is virgin ground. Things unknown to science may turn up in any direction. Such conditions are enough to excite our envy, cramped up in over-populated England. I saw scores of bottles crammed full with strange sponges, Echinoderms, Hydroids and Polyzoa; not one quarter of these had been examined, and doubtless new genera and species lie waiting to be described. The difficulty during a short visit—where life is so prolific—is to know what to study; there is material for years' work. If these lines should meet the eyes of any member of the Melbourne Field Naturalists' Club, I venture to suggest that he should forward a short account of one of their splendid expeditions (say to King Island this last year), to the Editor of SCIENCE-GOSSIP. It would prove deeply interesting to scores of fellow workers in far off Old England.

At one of these meetings in Melbourne, Professor Baldwin Spencer, Biological instructor at the University, showed me a dish of sea water, containing the curious fish in a living state, *Amphioxus lanceolatus*, dredged up in Port Phillip. They are transparent, and barely exceed two inches in length, and possess the slightest possible structure. Having notes on this fish, I hope to deal more fully with the subject in the future.

Confirming the repeated assertion, that snakes swallow their young ones at the approach of danger, the following may not be without interest. On the 28th March, 1888, Mr. H. J. M'Cooey, at Coogee Bay, surprised a black snake (*Pseudechis porphyriacus*) in the scrub. It made a hissing sound or gulping noise, and opened the mouth wide; no less than eighteen young ones rapidly disappeared down its throat. He killed the snake and thirteen young ones; the remainder escaped as the parent was dissected. Mr. John Taylor, a shipper well known in Queensland trade, informed me he had himself seen a large black snake swallow her young. I think ample proof of this now exists from various parts of the world, and in England we may still look for evidence that the common viper performs a similar feat.

I cannot at present put into shape my impressions of the Sydney and Melbourne Botanic Gardens. From the directors of both, I met with all facilities and assistance in studying the Australian and tropical flora. I am now occupied in planting seeds of typical Australian plants in an English green-house, from a splendid collection given to me by Mr. W. Guilfoyle, F.L.S., of Melbourne Gardens. Among them are hakeas, acacias, eucalypts, casuarinas, pittosporums, and many beautiful species.

It is strange to see how the weeping willow flourishes at the antipodes. Indeed, this *Salix Babylonica* is a wonderful tree, and appears to be transmitted by cutting all over the world, wherever civilisation advances. I believe the male plant only is known, and the original home is said to be Asia. I picture it drooping on the terraces of the famous hanging gardens at Babylon, and likely enough it was the same tree mentioned by the Hebrew poet:

> "By the waters of Babylon we sat down and wept . . .
> As for our harps, we hanged them up upon the trees that are therein."

But where on earth has the female plant gone? Have any of your readers seen it?

THE ERRONEOUS REPUTATIONS OF REPTILES.

It is surprising how manifold and ridiculous are the popular errors connected with reptile life. The common slow-worm (*Anguis fragilis*), alias blind-worm, is believed by ninety-nine out of every hundred of the uneducated to be, as its latter name implies, blind; although its eyes, though small in comparison

with its size, are very bright. Indeed, their very insignificance of size seems to be compensated for by their remarkable brilliancy and beauty. A slow-worm's eye is the prettiest part of its whole body. Another delusion of those ignorant of natural history and its teachings (although like most of the other erroneous notions of reptile life, such belief, owing to the advance of scientific culture, is rapidly on the decline) is that a slow-worm can inflict a bite that is poisonous. It is well I have said "those ignorant of natural history and its teachings," for it is evident if these ignorant ones were more conversant with nature, they could not labour under such an error. It is as much an impossibility for a slow-worm to poison anyone, as it is for an eel to do so, for the very simple but conclusive reason that, instead of possessing fangs with which to inject poison and a pair of glands from which to secret the venom, it possesses numerous minute teeth. The use of these teeth to the slow-worm is not very obvious, for it swallows its food whole. In the summer of last year I was returning from a ramble, with a half dead slow-worm in my hand, when I met an acquaintance. After we had been talking for some time, the gentleman, who, by the way, had sorely neglected the fascinating study of nature, although he was an artist, told me he was once bitten by a slow-worm, and that the wound became very much inflamed. There is no doubt he was bitten by an adder and not a slow-worm, for the latter's teeth cannot pierce the epidermis. Another belief, common among the uncultured, is that snakes "sting," and that they do so by means of that wonderful structure, the forked tongue. This is probably the reason the slow-worm, as well as the ringed snake, has gained its present reputation of "stinging" and "poisoning." The common ringed snake (*Natrix torquata*) is reputed to be venomous, no doubt, as I have said before, in consequence of its possessing a forked tongue.

Adders are deservedly known to be as venomous as *Anguis fragilis* and *Natrix torquata* are harmless. Frogs and toads have been believed for many years to be capable of existing under most extraordinary circumstances, and are even now believed by many to have the power of living without food and air for months and even years. It is truly marvellous how long reptiles can live without food. Here are a few instances, very kindly furnished by Mr. Halfpenny, which I quote, not because they are extraordinary, for there are many others on record much more wonderful, but because they are of recent occurrence and their accuracy can be relied on. "I have a young live adder in my possession which has taken no food since I have had it, the first week of last October (1884)." This would be nearly four months the adder fasted, and it is the more perplexing, that during this period, the adder has been kept in a case in a warm room, where the fire was constantly burning. The adder had not therefore been dormant during those four months, but constantly wearing away tissue which it could not repair. He then goes on to say, "A toad I have kept four months without food, and a triton six; the same fact has been observed in the tortoise by a friend of mine. They each expired at the end of that period." According to occasional reports, frogs (*Rana temporaria*) and toads (*Bufo vulgaris*) have been found alive in rocks and trees where they must have been for years, without the possibility of air penetrating to them, much less food. If a toad or frog has been found alive under these circumstances, depend upon it both air and food in some way penetrated to the prisoner. Dr. Buckland, by his experiments, has perhaps done more to dispel this absurd idea than any one. He confined twelve toads in separate holes cut in soft sandstone and covered the apertures with plates of glass firmly cemented to the sandstone, so as to exclude both insects and air. When about a year had elapsed he examined the holes, and of course found the toads dead. Toads are also thought by many to be capable of emitting fire. As a matter of fact they cannot "spit fire," but still it is interesting to note how credulous some people are in the nineteenth century. The toad, in spite of its evil character, has been found by gardeners a most useful adjunct, being very effectual in ridding the garden of insects. The last reptiles to be mentioned are newts (*Triton cristatus* and *Triton punctatus*) and lizards. All these creatures are believed to be capable of biting, and thus inflicting a nasty, if not dangerous wound. How some of the errors, which I have enumerated were originated, is a fitting subject for the philosopher. The humble naturalist will not venture an opinion on so profound a mystery.

ARTHUR AYLING.

THE ECDYSIS OF INSECTS.

ONE of the writers in the August number of SCIENCE-GOSSIP, described a specimen of *Phthirius inguinalis*, in which he noticed that within each of the animal's claws there existed another claw, resembling the one within which it was situated. He asked, with great caution, whether it was possible that the animal was about to moult. There can be no doubt in my mind that such is the case. All insects which do not pass through the regular stages of larva, pupa, and imago, but at all times resemble the adult animal, periodically cast their inelastic, chitinous skins. As examples of this can be taken, the cockroaches, crickets, aphides, earwigs, and the whole family of bugs. Were it not for this provision, these animals would not be able to grow.

The state of things described in the August number, is not confined to the *Phthirius inguinalis*.

I have observed the same in several specimens of *Pediculus capitis*.

In the specimens examined by myself, the whole of the skin was seen to be reduplicated. Two sets of spiracles, one within the other, were beautifully shown. In all the great tracheal vessels, the spiral membrane was seen to be double, the inner tube being continuous with the outer skin of the abdomen, thus showing that the tracheæ are shed as well as the external skin.

The most interesting fact, however, that my specimens showed, was, that not merely the shell or exoskeleton was about to be shed, but also the muscles that worked the terminal joint, a phenomenon that has not, I believe, been hitherto observed.

bodies, and are marked with fine transverse striae. The muscle which flexes the outer claw is seen to be entirely outside the inner shell, and must, therefore, be cast off when the animal casts the outer skin.

It has been objected, by one *savant* to whom I submitted my specimens and views, that the striated bodies in question are not muscles at all, but merely tracheal dilatations, and that the apparent muscular striation is caused by the spiral thickening within those tracheal dilatations. This objection seems to be frivolous. At any rate, it is easily overcome. If the striæ were due to the tracheal spiral, they would present, when the microscope is focussed half through their substance, a dotted appearance at their ends. This is found not to be the case.

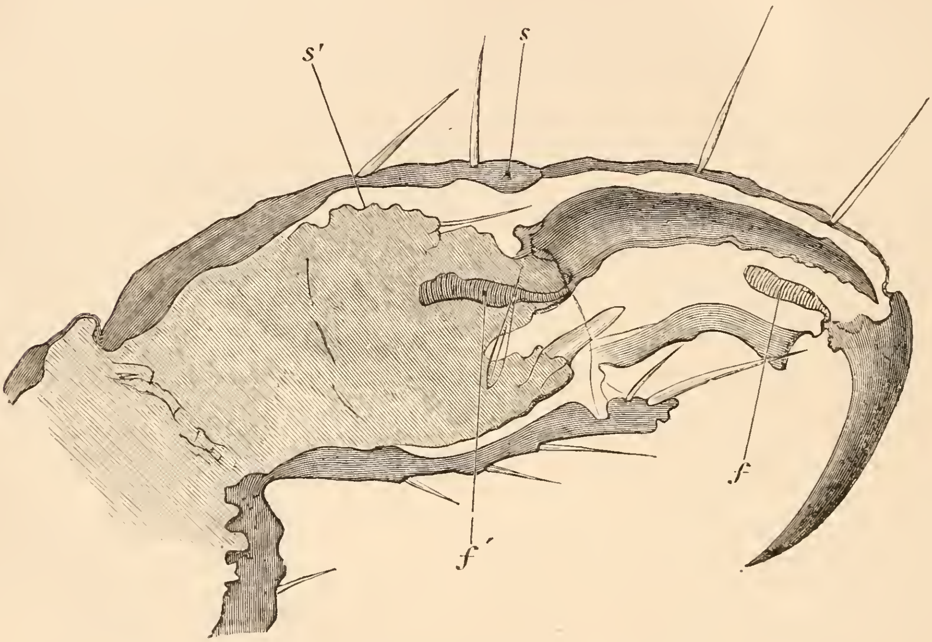

Fig. 82.—Ecdysis of *Pediculus capitis* (highly magnified).

The accompanying diagram, drawn with the aid of a camera lucida, from the foot of a *Pediculus capitis*, will serve to show what I mean. The last three joints are represented. Within the shell of these can be seen the new skin (*s'*). This is seen to be delicate and wrinkled ; it does not become chitinous until the removal of the outer shell (*s*).

The relative position of the two terminal joints, or claws, is peculiar, and has an important bearing upon what follows. It is seen that the terminal claw of the inner, or new limb, lies not within the corresponding claw of the outer limb, but within the last joint but one.

Attached to the base of both of the terminal claws can be seen the muscles—*f*, *f'*—by which they are flexed. They are elongated sub-cylindrical

The very position of these bodies shows them to be flexor muscles. They are inserted into the only available part of the claws, and lie in the only possible direction in which properly-acting flexors could lie.

Even supposing that these bodies are not muscular, it stands to sense, from the relative position of the two claws, that the muscles within the inner skin cannot possibly act upon the outer claw. Hence, those that do move the outer claw must lie within the space between the two, and must therefore be thrown off when the ecdysis takes place.

The specimen from which the drawing was made, was mounted in Canada balsam, after being first treated with potash, and cleared with turpentine.

JAMES HARVEY.

Scarborough.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

A BIG METEORITE.—A visit to the collection of meteorites at the end of the mineral room of the British Museum, presents a curious commentary on the fact that, until the beginning of the present century, the orthodox scientists denied their existence, and treated all accounts of their fall as they now treat all descriptions of the sea serpent, they would have sacrificed their scientific reputation had they done otherwise. This, in spite of the actual exhibition in London, in 1796, of a stone weighing fifty-six pounds, utterly different in composition and appearance from any rock known to exist on the face of the earth, and the fall of which was witnessed and attested by several credible witnesses.

The Royal Society of that date refused to listen to the evidence; but was forced to do so in 1802, and now it listens placidly to a theory which builds up the stars, and all the other heavenly bodies, of these wandering lumps.

The National Museum of Brazil has lately secured a noble specimen, weighing 11,800 lbs. The cost of its transport was defrayed by Baron Greahy. The survey of its route, and preliminary arrangements, occupied three months; its journey commenced on November 25th, 1887, and it reached the railway by which its journey was completed, on May 14th of the present year. It had to cross above a hundred streams, to ascend 870 feet over one mountain chain, besides crossing many of smaller elevation, and this in a region of mule paths. The distance from Bendego Creek, where it was lying, to the railway that finally carried it to Rio, is 71½ miles.

Relative Nutritive Value of Starch and Fat.—According to some recent experiments made by O. Kellner, who fed horses on different materials and compared the results, the nutritive value of linseed oil as compared with starch, is 2·6 to 1. These figures were based on calculation of the work done, and it should be noted that the comparison is made between vegetable oil and farinaceous vegetable food.

I am not surprised at this result, having long ago witnessed similar experiments made upon human beings in Shropshire. At the time when mowing machines were but little used, large numbers of Irish labourers came across to assist in the hay harvest. These were typical specimens of poor cottiers, who at home fed almost entirely upon potatoes, i.e. mainly upon starch. At first, for a week or two, the Irishmen were unable to keep up with the English labourers in mowing, a kind of work which pretty accurately measures the muscular energy of the labourer when paid for by the acre. At the end of about a fortnight, they became able to do their fair share, having in the meantime been largely fed on fat bacon. The Irish labourers were annual visitors, and had the same amount of training in the peculiar muscular action of mowing as the Englishmen.

My observations in Ireland in the course of four summers, during which I visited every county of the "distressful country," convinced me that the politicians on both sides are raving in vain; that the chief curse of Ireland is neither the Saxon, nor the priest, nor the league, nor the tory, nor the radical, but is the potato; and the craving for a sluggish distension of the stomach which is generated by potato feeding, becomes a vice that in many cases is comparable to the alcohol crave. Mr. Parnell would be converted into a true patriot, a genuine benefactor to his country, if he would import the Colorado beetle, or any other creature that should devastate and finally extirpate the debasing tuber. Even pigs degenerate if fed upon it exclusively, and human beings similarly fed suffer from a combination of habitual distension, and lack of nutrition that deprives them of both physical and moral energy. The Irishman transplanted to America and properly fed, becomes quite an altered being, so far as industry and general energy are concerned.

Consumption of Muscle by Exercise.—In Chapter xix. of "The Chemistry of Cookery," I have discussed the two rival theories of the "Physiology of Nutrition," that of Liebig, and that which has been lately picked up by certain fashionable physicians. The first asserts that life-work is generated by the transformation or self-decomposition of living tissue, the latter that it is due to the combustion o food. According to the first, the work is done by the consumption of the engine itself, which the food renews; according to the second, by the combustion of the food, as by the coal of our steam engines. I believe that Liebig is right, and that the analogy of the steam engine, which is claimed for the modern theory, is utterly fallacious.

This view is confirmed by experiments recently conducted by A. Monari, and recorded in the "Gazetta Chemica Italiana." Monari has determined the difference of the chemical composition of muscle before and after exercise by killing full-grown dogs after repose, and others after protracted exercise. He finds that the proportions of both creatine and creatinine are increased by fatigue, and that this is especially the case with the creatine. The results of his analyses are displayed in tables.

To appreciate the significance of this result, it is necessary to understand that the destruction of muscle, which Liebig described as the chief source of animal mechanical energy (that of nervous tissue being also demanded in a lesser degree), is shown by the conversion of organised matter into saline material of a chemical character intermediate between itself and ordinary mineral matter. Such is urea, kreatine,

and kreatinine, the two latter being salts of some complexity of constitution, as compared with the usually simple constitution of purely mineral salts.

The True Advancement of Science.—There is one passage in the interesting address recently delivered by Sir Frederick Bramwell before the British Association, that should be read, marked, learned, and inwardly digested, by some of our modern scientists, or, more properly speaking, pedants. I refer to that class who pretend to despise popular science, and who imitate the vegetarian fox of the fable in their treatment of those who have grasped the great truths of science with sufficient thoroughness to be able to expound them clearly and simply, and thus place them within the reach of all intelligent people.

Sir Frederick Bramwell reminded the Association that its declared and primary object is the "advancement of science," and that such advancement implies its practical application for the benefit of mankind. The class of benefits to which he, as a civil engineer maintaining the dignity of his vocation, especially referred, were those physical blessings which science, in the hands of its best votaries, has so beneficently showered upon us.

Besides these, there is another class of blessings which the teacher who diffuses science among the millions is justified in extolling, viz. the moral advancement which necessarily follows its general diffusion. The poetry of creation is an epic, compared to which all the poetry of the human imagination is but nursery rhyming; and the highest and purest of all religion is the worship of divine truth, the teaching and the application of which is the whole and sole business of science.

Mere discovery is but one of these three steps, and, being the first, should be honoured accordingly. Without the other two it is worthless, and may even be mischievous by perverting the religion of pure truth to the vile purpose of creating a pestiferous priesthood of pharisaical pedants; pretentious prigs, who would appropriate for their own purposes of self-exaltation, that intellectual wealth which is the common property of all mankind.

The British Association has nobly fulfilled its purpose in the true advancement of science by its missionary work throughout the kingdom. Wherever it has halted, held its meetings, and made its excursions, a popular awakening and elevation of intellect has followed. Its admission of all to membership prevents the possibility of its partaking in any degree of the character of a mutual admiration club, and constitutes a bold and clear expression of the common rights of all human beings to freely partake of the intellectual banquet which science has prepared.

Action of Coal-Tar Dyes.—One of the peculiarities of the coal-tar dyes is their partiality to animal substances, such as wool and silk. To these they adhere with admirable pertinacity, saving the dyer all the trouble of preliminary or subsequent treatment with mordants to destroy the solubility of the dye, and fix it to the fabric. To apply the coal-tar dyes, he simply immerses the fabric in the hot solution of the colour, retaining it there for a longer or shorter time, usually at a boiling heat. I have frequently made the experiment of immersing a skein of natural silk cleansed from its "silk glue" by alkali, in a solution of the dye, and boiling this until the colour leaves the water and goes over to the silk, the water thus becoming quite colourless, thereby showing a positive appropriation of all the dye by the silk, which is quite different from mere participation of stain.

E. Knecht has recently investigated this subject, in order to determine whether the taking up of these dyes by the fibre is a chemical or mechanical process. He submitted woollen and silken fibres to the action of hot solutions of the dyes until all the colour was taken up by the fibre, then analysed the decolorised solution, and found it to contain ammonia derived from the fibre, and that, in the case of rosaniline hydrochloride, the hydrochloric acid remained in the solution, and the rosaniline had gone over to the fibre. He found that similar changes occurred with other colours, such as diamido-azobenzine-hydrochloride, &c. These results he regards as proving that the adhesion of the dye in such cases is a quantitative chemical change and not a mechanical process; or, to express it otherwise, the dyed silk or wool is a chemical compound of the silk or wool itself or some constituent thereof with the colouring matter.

Improved Wine.—The following from the Journal of the Chemical Society of July, page 737, is a summary of the results of the experiments of Laborde and Magnan on the toxic or poisoning action of alcohols, and of the artificial bouquets that modern chemical science has supplied to the ingenious manufacturers of high-class wines. I copy it to afford some cheerful reading for those who are fond of such beverages, merely explaining that the liqueurs named are some of those usually added to champagnes, &c., or which, skilfully applied to fortified *vin ordinaire*, converts it into choice vintage with exquisite bouquet, and raises its price in this country from one shilling to five, ten, twenty, or thirty shillings per bottle, according to the label or cobwebs. "Salicaldehyde, which is added to vermuth, bitter, and essence de reine des prés, produces strong epileptic convulsions. Methyl salicylate, which is used as a substitute for oil of winter-green in vermuth and bitter, also produces convulsions, although not of an epileptic form. Benzonitrile and benzaldehyde, which are added in small quantities to noyau, produce tetanus and even death."

I was glad to read in a recent number of "The Asclepiad," an article by Dr. B. W. Richardson, on "Alcohol at the Bedside," and to find there from the pen of one of the most staunch and determined of abstainers a decided recognition of the great medicinal value of alcohol, which some fanatical teetotalers have lately denied, who would prohibit its use in hospitals, and banish it from the pharmacopœia. But Dr. Richardson protests against prescribing it in the form of wine or other commercial beverage. He insists upon the use of pure ethylic alcohol, dispensed like other drugs, and mixed by the dispenser only with the other items of the prescription. The modern manufacture of choice wines renders it absolutely impossible for the physician to know what he is prescribing when he recommends the use of any of them. His grandfather may possibly have formed some idea of the composition of the wine of his period.

RUDIMENTS AND VESTIGES.

IN the controversy on this subject in the pages of SCIENCE-GOSSIP during the last year, there have been, besides various side issues, two distinct questions under discussion, both of which Miss Layard started in her original article in SCIENCE-GOSSIP for October, 1887, and which, it seems to me, should be studiously kept separate.

The first of these is, whether Mr. Darwin's use of the word rudimentary in the "Descent of Man," etc., is in accordance with its etymological and generally accepted sense.

I think that, as Miss Layard says in her last contribution to the discussion, there has been a general consensus of opinion "that a better word might be substituted;" but, at the same time, as she rather implies by using the words "reluctant recognition," there has been a general feeling that the matter was not of the first importance when compared with Miss Layard's other contention.

For although Miss Layard is absolutely right in saying that "if Mr. Darwin, by his persistent accuracy, has taught his readers to submit terms as well as facts to a strict investigation, he would have been the last to complain of the jealous regard for truth which cannot sanction the misuse of a single word;" still this possible misuse sinks into absolute insignificance beside the other question which Miss Layard has raised. As a matter of fact, not only by Darwin, but by many others among the first authorities, is the word used in this sense, as a consultation of the pages of "Nature" will show at once. Still it is an undoubted fact, that this use is not in accordance with the derivation of the word, nor its general use.

Miss Layard has, however, from the first, associated with this a question of vastly more importance than the possible misuse of a word could be, inasmuch as it affects the whole conception of organic evolution. This is whether one or more of man's organs may or may not be said to be in a lower state of development than any corresponding ones throughout organic nature. At the base of Miss Layard's argument on this subject, there appears to me to lie a fundamental misconception of the nature of organic evolution, and it is connected with the use of such words as "typical standard," "progression," "retrogression," etc. For while Miss Layard says in her last notes on the subject that "it does not necessarily follow" from "the unmistakable family likeness running throughout creation" "that we are justified in making invidious comparisons between organs specially adapted to differing purposes," she herself makes these "individious comparisons" in her first article by saying: "Allowing, as we must, man's to be the ideal form, might it not be more correct to speak of the lower forms which preceded it as made up of excrescences and deficiencies?" And again: "The tail should . . . be regarded as an excrescence, the ape being the rough sketch of the ideal form, before the artist had pared off the superfluous clay. To a casual observer, the huge shoulder bones, and the formidable jaw and teeth of the ape, might argue a superiority over the same organs in man. . . . but when we consider the deficient brain of the anthropoid ape, and his small skull, we see at once that to keep the balance true, excrescences in one organ were bound to make up for deficiencies in another."

It is precisely this arbitrary setting up of a "typical standard," or an "ideal form," for the whole organism, rather than judging organisms by their relation to environment, which Mr. Fenn wrote to combat in the November SCIENCE-GOSSIP, and which Miss Layard herself now deprecates. The only justifiable use of such a phrase is when it is applied to the most highly-developed known form of an organ or set of organs. Thus Sachs, in his "Physiology of Plants" (p. 6), says: "I name organic forms which present the essential peculiarities in great perfection, and from which, therefore, a clear scientific consideration best proceeds, *typical forms*." In this sense the tail of the lower animals must be regarded as the *typical form*, not as an "excrescence," while our *os coccyx* is, on the other hand, not a "more perfect shortened formation," but in a lower state of development and therefore "rudimentary," or, if Miss Layard will, "reduced." This then is the only sense in which I used the word, and it is difficult to see in what other sense it could be used by any one accepting the theory of organic evolution as generally understood. For the setting up of an arbitrary standard of perfection would imply the operation of an intelligent agency, and would be entirely inconsistent with the operation of a factor like natural selection, or the inheritance of

functionally-produced modifications, which, of course, ultimately consist in the action of certain purely mechanical environing agencies on the organism. And it must be remembered that this conception of organic evolution is not the idea of any school of ultra-Darwinians, but the opinion of nearly all the prominent men of science of the day. I allude to men like Professor Huxley, Mr. Herbert Spencer, and Dr. Romanes. Every organism then being what it is in virtue of its varied and changing environment, it would be manifestly absurd to set up an arbitrary standard of perfection. Yet this is what Miss Layard did in her earlier articles. "That standard," she said, in effect, "is man."

Thus it will be seen that while Miss Layard attributes to me the use of the phrase "typical standard," etc., in a sense that requires an assumption which, as I have endeavoured to show, an evolutionist (in the usually understood sense) could not have made, she herself makes this very assumption in her earlier articles.

Again, in Miss Layard's most recent contribution, she makes some assumptions for which I can find no warrant in the correspondence on the subject. For instance, she says: "An evolution of retrogression is cheerfully accepted as the gradual means by which man has arrived at his present physical condition, and on this poor. . . instrument, his brain, which apparently alone has progressed, is to act, with this astonishing result, that he is 'the most perfect animal known.'" Now, who ever asserted or implied that "the brain alone has progressed"? Again, I fail to see "the inconsistency of a brain that has progressed being prepared to work an organism that has retrograded," taking retrogression, as I imagine all evolutionists must, to mean that certain altered conditions have necessitated a corresponding modification of function, and this again has reacted on the body, and produced certain modifications of structure, the process being in some cases combined with the action of natural selection.

Again, the analogy with "Mozart attempting to play on a worn-out lodging-house piano," appears to me to be singularly unhappy; and for this reason—a mechanical instrument which the contrivers know can perform certain things, and must absolutely be worn out sooner or later, cannot possibly be compared with an organism, which has infinite powers of adapting itself to changed conditions.

Further, with regard to the quotation from Dr. Foster, which is summed up in the italicised words: "Its (the will's) operations are limited by the machinery at its command." Nobody asserted that the machinery at the command of the will was not adequate to perform the things man does perform. All that any of your correspondents contend, is that certain parts of this machinery are in a lower state of development than the corresponding parts of some of the lower animals.

Lastly, with regard to the two striking instances which I mentioned in SCIENCE-GOSSIP for June in support of this fact, I would point out that while I spoke of the *muscles themselves* of an ordinary civilised human being of the present day, Mr. Darwin speaks of the "*correlated action* of the muscles of the hand, arm, and shoulder" of a Fuegian, which is a somewhat different thing. My other instance Miss Layard has not attempted to answer.

In conclusion, I would repeat that organs, *per se*, can only be considered more or less perfect in proportion as they are more or less able to perform the functions for which they were developed; and that, therefore, no organism can be said to be "ideal" unless every one of its organs performs its functions more completely than any corresponding ones throughout organic nature. As no organism, from the changing nature of the environing conditions can possibly conform to this standard, to call man or any other organism "the ideal form," is entirely inconsistent with the fundamental principles of organic evolution.

A. G. TANSLEY.

LATHYRUS TUBEROSUS IN SUSSEX.

A MOST interesting floral "find" in Sussex during the present summer has been that of the pease earth-nut (*Lathyrus tuberosus*), by R. D. Postans, Esq., who observed it on the shingle beach at Eastbourne in full bloom in the first week in August. He then sent me a specimen with its lovely crimson flowers, but with only a portion of its creeping rootstock. Afterwards, however, using a trowel, the rootlets, with its remarkable tubers, were also found. These were forwarded on the 16th, and are here represented of the natural size; one of them weighed a quarter of an ounce. As this curious species, so far as I know, has only occurred previously at Fyfield, near Chipping Ongar, in Essex, Gibson's account of it may be quoted:—"This beautiful plant was first noticed here by Octavius Corder in 1859, and distinguished in the following year. It grows about Fyfield, extending over a district three miles in extent. A plant so conspicuous might naturally be supposed to be a recent introduction, but a resident farmer has noticed it growing abundantly in the same fields for the last sixty years." He also observes: "The Rev. W. W. Newbould finds specimens of *L. tuberosus* in the British Museum, in the collections of Buddle and Petiver, Buddle stating: 'I had it from the Rev. Mr. John Sedgwick, who gathered it not far from Lincoln in the north field of Blankney, near the road to Lincoln.'" The locality in which the Sussex plant occurs, *i.e.* the shingle beach at Eastbourne, differs greatly from that mentioned by Gibson, viz.

in several corn-fields and also along the hedge banks and borders of the same fields. The figure of this species as given in Gibson's "Flora," is a good one, with the exception of the leaflets, which are represented as ovate, whereas they are obovate; but truer to nature than either the engravings of Gibson or Syme is the old woodcut of Gerard, headed *Terræ glandes*, pease earth-nut, while his verbal description allowing for the absence of technicalities is excellent.

"The pease earth-nut commeth vp with slender and weake stalkes: the leaves be thin, and little, growing upon slender stems, with clasping tendrils at the ends, with which it imbraceth and taketh hold of such things as stand neere onto it: the flowres on the tops of the stalkes are like to those of pease, but lesser, of a red purple colour, in smell not unpleasant; in their places come up long cods, in which are three or four round seeds: the roots be thicke, long, like after a sort to acorns, but much greater, blacke, without, gray within, in taste like to the chesse-nut; out of which beneath doth hang a long slender string." He mentions also that by the Dutch, the curious tubers are called "tailed mise of the similitude or likenesse of domesticall mise, which the blacke, round and long nuts, with a piece of the slender string hanging out behind do represent," and to a dead and shrivelled mouse they have certainly a quaint resemblance. Gerard states that although this plant is common in Germany, he had not heard of its occurrence in England. In Holland it is stated to be used

Fig. 83.—*Lathyrus tuberosus.*

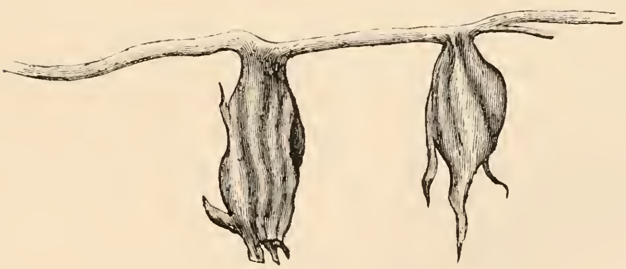

Fig. 84.—Rootstock and tubers of *Lathyrus tuberosus.*

as an esculent. We have now records of its occurrence in Essex and Sussex, but how it got to either of these localities, so far distant from each other, has not as yet been accounted for.

F. H. ARNOLD.

A WINTER IN MASSAUA.

DURING last winter the steamer I commanded was taken up by the Italian Government for condensing purposes, and in spare time I amused myself by making a few notes on the Natural History of the place I was sent to, Massaua, and its immediate neighbourhood, the results of which notes I here generalise, hoping they may prove of some interest. Many men situated as I am visit places from whence no notes or collections have ever been made, and it is the hope that something may be done in that way, that encourages me to place these few lines before you; and I shall arrange them under different heads.

1. *General Description.*—Massaua is situated on a small island on the western side of the Red Sea, and has a population of about 8000 inhabitants, comprising a most heterogeneous collection of Abyssinians, Gallas, Somalis, Arabs, Egyptians, Soudanese and Hindoos. There are a few good houses, built of coral rock, with thick walls, and, as is customary in Eastern places, flat roofs, very effectual in keeping out the heat; but the majority of natives live in ramshackle huts made of a few poles and rough mats, which, during the heavy winter rains afford little protection against the elements. There is very little sickness; rheumatic fever however amongst the natives is the most prevalent ailment, and from it the Italian troops suffered a good deal. There is far less sickness during the hot dry summer than in the winter. At Massaua is established a French Catholic Mission and at Makullo (a village about 3½ miles W.N.W. of Massaua) a Swedish Protestant Mission, both doing good work. At the latter I met with great hospitality and kindness, and was able to get a good deal of information. There are no wells in Massaua, all the water is brought by pipes from Makullo, at which place there is a good and constant supply, though the water is slightly brackish.

With Suakim (which is situated 242 miles to the N.W. by N.) it has always formed one of the best harbours on this coast, and through it all the outside trade of Abyssinia has been conducted. Although practically not forming a part of the Abyssinian dominions, it has generally been looked upon as the port of that country, not only by the outer world but more especially by the Abyssinians themselves. Since 1557 it has been nominally under Turkish and Egyptian rule, but in 1884, under a treaty between King John (the Negus of Abyssinia), the English and Egyptians, the Italians obtained a footing and have recently declared their intention of holding the place altogether. From Massaua to Saati (a place 25 miles inland to W.S.W.) the Italians have laid down a substantial railway well guarded by forts. Owing to recent hostilities, the port has been closed to commerce from the interior, and it will take some time to restore the native confidence and trade.

2. *Physical Geography.*—Massaua is situated in latitude 15° 37′ 2 N., longitude 39° 27′ E., on a small island in a creek formed by Jerrar and Massaua bays on the N. and W.N.W., and Harkiko Bay on the S., which bays have good channels into them of five or six fathoms depth, forming good though not extensive anchorages. The island is connected by a long causeway to the mainland which here—as nearly all down the west coast of the Red Sea—stretches away as a flat plain to the foot of the low range of hills about three miles distant. This plain is formed of alluvium spread over the substratum of coral formations in many places (under the alluvium) in a very perfect state of preservation, while here and there the coral crops up above the soil in jagged rain-worn rocks. So unlike real coral are these rocks that it is only by a close examination that its real character can be determined. The hills are volcanic and are those known as the Aden volcanic series (Blandford). Beyond these hills stretches inland an almost uninterrupted succession of hills and valleys forming in some places a most rugged country, and gradually rising in altitude from 500 or 600 feet at the first hills to the grand mountain ranges 10,000 feet high in Abyssinia. The hills near Massaua show no signs of recent volcanic activity, though a little farther inland, near Dogali, there are well-defined lava beds. From the valleys several wide and shallow river beds can be seen, one very well defined, passing by Makullo and debouching into Jerrar Bay, though I could hear of no water ever having flowed in it, on the surface. But at almost any time of the year, water can be obtained by digging into the bed, in fact while I was there it could easily be got in a few minutes by scooping out the soil with the hands to the depth of a foot. That there have been many rushes of water down this bed is proved by the fact, (1) that the plain is thickly covered in places (particularly N. of Otumlo Bay) with fragments of rocks such as obsidian, mica-schists, quartzite, porphyrite, and rhyolite, which could only have been brought down from the interior by rushes of water; and (2) the plain is formed by alluvial soil from the interior. The overspreading of the fringing coral reefs is particularly to be noticed, as by this means the Red Sea is slowly but surely being filled up. In "Nature," of April 26th last, I particularly allude to the coral formations here, and also to the gradual upheaval of the coral, so that we have the two forces of upheaval and deposition working together. I consider there to have been upheaval

chiefly from the following fact. Many of the coral masses on the plain are very much undermined by the action of water, which action can be seen still at work round the harbour. From high-water mark seaward the water deepens gradually to about three or four feet just inside the edge of the reef, then shallows slightly immediately over the edge, then drops suddenly to four or five fathoms deep. The part between the edge of the reef and the high-water mark is slowly filling up with disintegrated coral débris and sand drift, and is also being raised by upheaval, which latter action seems to be intermittent rather than continuous. It would be extremely interesting if continuous observations on the growth, etc., of the coral were made at some such place as this. Everything is favourable for such observations to be taken, either in this port or at Suakim. Most curious is it to note how in some places the edge of the coral reef may be quite close to the high-water mark, while in other places, at some distance off. Possibly this may be owing to the way in which the tide currents strike the reef, in some places continually bringing in fresh supplies of food, in others reaching the reef after being exhausted of food supply. On the seaward side of the coast there is a long line of coral islands, with a deep water channel inside, and I cannot help thinking that by the same process these too will be gradually joined to the mainland, not so rapidly, unless there is more rapid upheaval, for the alluvium will have farther to travel. Earthquakes are by no means rare phenomena here, and signs can be seen in Massaua, as cracked buildings, etc., which testify to the severity of the shocks.

3. *Vegetation.*—On my arrival towards the end of November there was very little vegetation on the plain, but it very soon began to sprout up in the most marvellous way, and, at the beginning of February, not only the plain but also the hills looked quite green and nice. Scattered about the plain were clumps of large cacti up which climbed several kinds of creepers, and then there was a large fleshy-leaved shrub with a handsome yellow flower, said to be poisonous. There are dozens of pretty little flowering plants which seem to spring up as if by magic, out of what appears the most barren soil, though undoubtedly it does look so barren, yet it is very rich and with irrigation would grow almost anything. There are only a very few trees, and these have been planted and have to be well cared, or else the summer heat would soon shrivel them up. Although summer and winter are at the same time here as in England, yet their effect upon vegetable and animal life is practically reversed: plants flower, and animals breed in the winter, in summer all is quiet, no vegetation, few animals and no insects, all is at rest, owing to the intense heat.

4. *Zoology.*—It is chiefly owing to the lack of surface water that the fauna is so poor: of animals a species of hyæna, a small gazelle, called by the natives "Dig Dig," a ground squirrel (*Xerus rutilus*), a small jerboa, and a small bat were all I saw. At times leopards are seen in the neighbourhood, but they are becoming rare now.

DAVID WILSON-BARKER.

66, *Gloucester Crescent, Regent's Park.*

(*To be continued.*)

THE WATER-SPIDER (*ARGYRONETA AQUATICA*).

THROUGH reckless collectors and would-be aquariumists not knowing, or taking proper precaution as to the natural habits of the water-spider, and the insertion of more voracious enemies in the same compartment, has probably arisen the scarcity of this amusing aquatic creature.

Yet, when in captivity, its movements may be watched with facility while spinning from plant

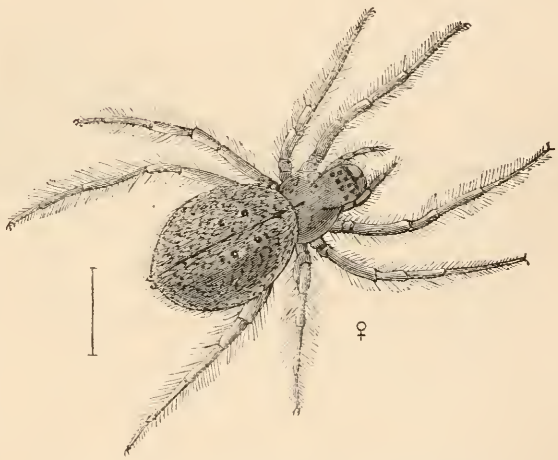

Fig. 85.—Female of water-spider (*Argyroneta aquatica*).

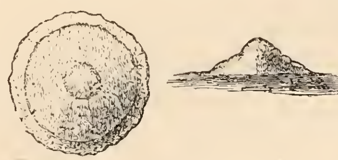

Fig. 86.—Cocoon of *Argyroneta aquatica*.

to plant its fine webby path, and occasionally ascending to the surface of the water to refill with air the silken envelope with which its body and respiratory organs are so wonderfully provided, for its existence while under water; then, the fact of its hinder legs guarding the silvery-like bubble with

which it now descends with safety to its enclosed harbour, has rendered the water-spider one of our most amusing and interesting aquarium pets.

For several years it has been my pleasure to keep a few of these along with a variety of other, though select life in the aquaria. With newts or fish they seem perfectly agreeable, as one of the latter, a coloured fish (*Cyprinus auratus*) almost ten years old in the aquaria, to the surprise of all, made itself especially an associate, and playmate with its Crustaceous companions.

In a small tank, thickly beset with *Ranunculus diversifolius*, *Helosciadium inundatum*, and *Lemna polyrhiza*, with its broad fleshy fronds, and long spreading roots covering the surface, the whole thus formed a most suitable habitat, in which, for special observation, I placed several water-spiders, which I collected on the 5th of June, while out collecting aquatic plants. One, apart from the other, appeared to be somewhat restless; this of course was watched with anticipation, as the others had already made themselves at home. For the first two days it quickly traversed from side to side, making repeated attempts to climb the glass to effect an escape, but eventually it settled down, and was soon busily webbing together in a diverging manner the pectinate leaves of the water crowfoot; then going within its leafy shade, not only as it almost appeared to do, to examine or to arrange the work so far done, but actually to weave its silken cocoon, or nest, in which, on the fifth day, 10th of June, through a small opening it had left unwebbed from it closing on the sides of the glass, and which fortunately served the agreeable purpose of pursuing the future progress of what could be observed, the yellowish mass of egg surrounded with a glistening layer of air, distinctly separate from its still unfinished harbour.

After a day or so of rest, it further extended the nest downwards, in a bell or funnel form, until nearing two inches long; then closed the lower or wider portion, with the exception of two openings, one on each side, just to give leave of its exit or admission.

This being completed, the mother could often be seen gracefully wending her way to the surface, and carrying down large successive bubbles of air, then carefully liberating, one by one, in order to form a sufficient supply, in which it then remained for some days.

From the end of the first week the egg now gradually grew darker, and on July 1st, exactly the third week, the upper portion of the nest, or cocoon, was completely laden with young; when, the large globule of air slowly began to diminish, and on being exhausted, the mother seemed reluctant to find a further supply, as though she had done her duty.

Here the young naturally became troubled, and in the fourth week were quickly parading the interior of their cell, apparently for escape, which they, through the course of nature, effected on July 11th; thus, in about thirty days, over forty young were actively playing their delightful and youthful part, each bearing its silvery bubble, thus assuming the respective and peculiar characteristics of the parent.

The water-spider has its own instinction and acuteness, in repelling its aggressors, especially so

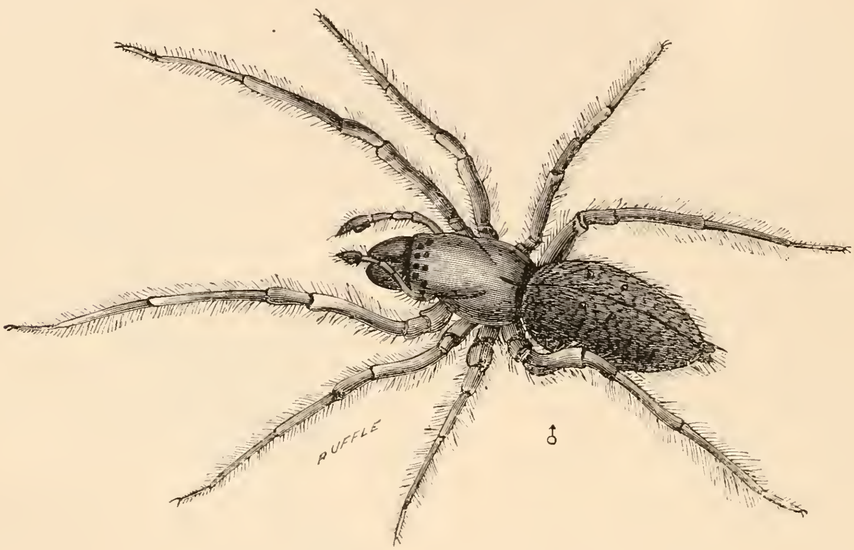

Fig. 87.—Male of water-spider (*Argyroneta aquatica*).

while guiding its young. During the course of hatching, my attention was drawn to what I may term a sudden conflict between the spider and the so-called water-shrimp (*Oniscus aquaticus*), which had unfortunately partly gained an entrance, but only to be rolled out a lifeless victim. On another occasion a trumpet snail (*Planorbis corneus*) happened to advance on the ends of its telephone. To such an herbaceous monster Argyroneta did not venture so very near, but with its furcated claws continued annoying, at each protrusion, the horns of the snail, till it reversed its course, then the water-spider retired the victor.

JOS. I. NEWTON.

NOTE ON WING OF A SPECIES OF TERMITE.

THE wing from which the drawings which accompany were made, was found with a number of similar cast-wings in a nest of the harmless black ant, common about houses here. I have obtained similar wings from undoubted termites secured during a flight. In the drawing, *a* represents the venation at the point of insertion; *b* is a more highly magnified view of the star-like dots distributed all over the cells of the wings; in *c* these star-like dots are still more highly magnified. They are shown in profile in *e*, in the folded edge of a wing; they are prominences which project above the surfaces of the wing, and are distinguishable from the strong, long hairs (*f*) which also occur, but less numerously. The star-like dots (prominences) appear on both surfaces of the wing. The venation of the entire organ is shown in *d*. The features alluded to in this note are brought out in a balsam mount; but in order to see the delicate contour of the projections on the folded edge of the wing, a little weak spirit and water is a preferable medium to balsam: *c* is from a balsam mount; *e e* are in dilute spirit.

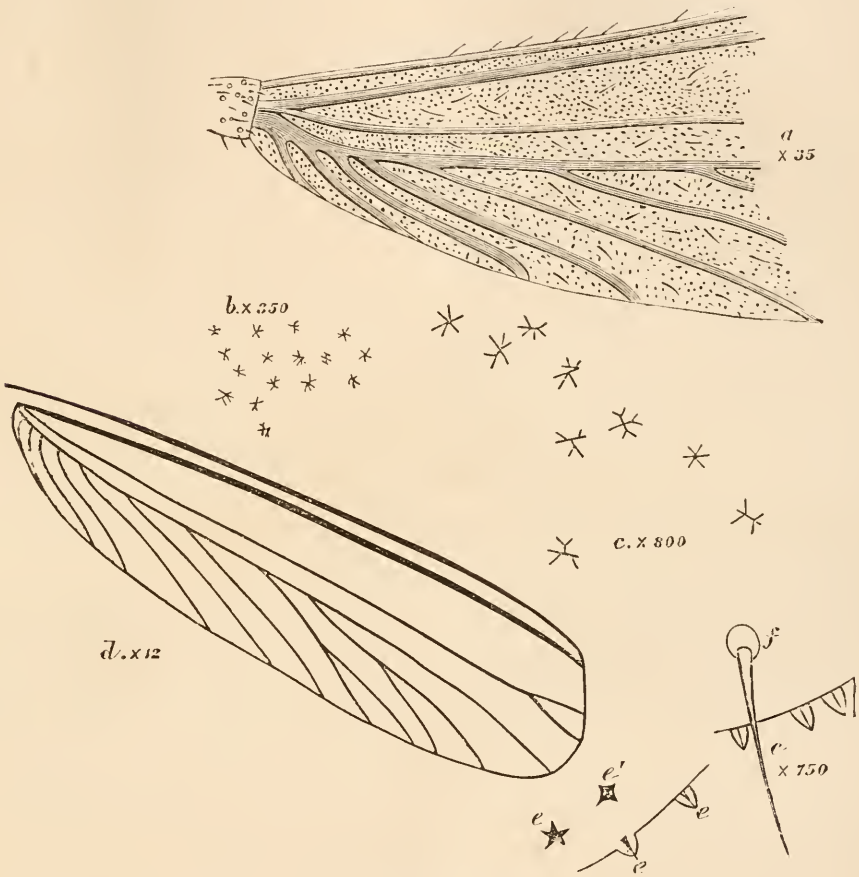

Fig. 88.—Wing of Termite.

W. J. SIMMONS.

Calcutta.

ASTRONOMY AND METEOROLOGY.

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

The "Observatory" states, that the provision of the funds required for the construction of two telescopes, to enable the Royal Observatories at Greenwich and the Cape of Good Hope to take part in the international scheme for charting the heavens by photography, has been sanctioned by the Treasury.

Earl Crawford and Balcarres has presented the whole of the equipment of his observatory at Dun Echt to the Government, on condition that they retain the administration of the Edinburgh Observatory, and do not make this over to the university, as it is said they intended.

A new comet (e. 1888) was discovered on the 3rd of September at the Lick Observatory, California, by Mr. Barnard, who describes it as a "circular, diameter 1′, magnitude 11 or fainter."

Professor Schiaparelli has published the first series of his observations of double stars containing measures of 465 binary systems, which he has obtained with the eight inch Merz refractor of the Royal Brera Observatory at Milan during eleven years. The number of the observations, which are chiefly of double stars, the components of which are within five seconds of each other, amounts to nearly four thousand.

On October 1st there will be an occultation of Saturn.

The disappearance takes place at 3 hrs. 59 min. aft.; at the time of reappearing the moon is below the horizon.

There will be no occultation in October of any star larger than the 4th magnitude.

Mercury will not be in a good position for observation in October.

Venus will be an evening star throughout the month, and will be in Virgo until the 7th, when she enters Libra.

Mars will be an evening star, but will be situated unfavourably for observation.

Jupiter will be an evening star, and will be in conjunction with the Moon on the 9th at 1 hr. morn.

Saturn will be in Leo and will rise about midnight.

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in October.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	7	8 47M	1 19A	5 51A
	14	8 57M	1 15A	5 33A
	21	8 40M	0 56A	5 12A
	28	7 40M	0 12A	4 44A
Venus ♀	7	8 27M	1 17A	6 7A
	14	8 49M	1 23A	5 57A
	21	9 12M	1 30A	5 48A
	28	9 34M	1 38A	5 42A
Mars ♂	7	0 18A	4 3A	7 48A
	14	0 14A	3 57A	7 40A
	21	0 10A	3 52A	7 34A
	28	0 5A	3 47A	7 29A
Jupiter ♃	7	10 50M	3 3A	7 16A
	14	10 29M	2 40A	6 51A
	21	10 10M	2 19A	6 28A
	28	9 49M	1 57A	6 5A
Saturn ♄	7	0 45M	8 16M	3 47A
	14	0 21M	7 51M	3 21A
	21	11 53M	7 22M	2 55A
	28	11 28M	6 56M	2 28A

Meteorology.—At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 18th August, was 29·67 in. on Monday morning, and the highest 30·16 in. at the end of the week. The mean temperature of the air was 56·4 deg., and 5·8 deg. below the average. The direction of the wind was variable. No rain fell during the week. The duration of registered bright sunshine in the week was 27·8 hours, against 36·4 hours at Glynde Place, Lewes.

For the week ending 25th August, the highest reading of the barometer was 30·10 in. at the beginning of the week, and the lowest was 29·43 in. on Friday evening. The mean temperature of the air was 60·0 deg., and 1·3 deg. below the average. The general direction of the wind was S.W. Rain fell on five days of the week, to the aggregate amount of 0·81 in. The duration of registered bright sunshine in the week was 29·2 hours, against 37·6 hours at Glynde Place, Lewes.

For the week ending 1st September, the lowest reading of the barometer was 29·32 in. on Tuesday evening, and the highest was 30·15 on Saturday morning. The mean temperature of the air was 56·6 deg., and 4 deg. below the average. The general direction of the wind was south-westerly. Rain fell on three days of the week, to the aggregate amount of 1·22 in. The duration of registered bright sunshine in the week was 32·2 hours, against 38·7 at Glynde Place, Lewes.

For the week ending 8th September, the lowest reading of the barometer was 29·75 in. on Monday afternoon, and the highest was 30·22 in. at the end of the week. The mean temperature of the air was 57·1 deg., and 2·4 deg. below the average. The general direction of the wind was south-westerly. Rain fell on six days of the week, to the aggregate amount of 0·16 in. The duration of registered bright sunshine in the week was 20·8 hours, against 27·2 hours at Glynde Place, Lewes.

For the week ending 15th September the lowest reading of the barometer was 29·94 in. on Monday morning, and the highest was 30·32 in. on Thursday morning. The mean temperature of the air was 54·5 deg., and 3·4 deg. below the average. The direction of the wind was variable. Rain fell on two days of

the week, to the aggregate amount of 0·06 of an inch. The duration of registered bright sunshine in the week was 42·4 hours, against 54·7 hours at Glynde Place, Lewes.

In October the isotherms form deep curves as they cross England and Scotland. The isotherm of 48° passes through Lanark, Roxburgh, and Haddington; that of 49° through Wigtown, Kirkcudbright, Stocktown and Newcastle; of 50° through Liverpool, Derby and Hull; of 51° through Denbigh, Hereford, Reading, Hertford and Cambridge, to the Wash; of 52° through Anglesea, Swansea, Salisbury, London, and the east coast off Ipswich; of 53° through Haverford West, Devonport, Brighton, and Canterbury. These isotherms represent the mean average temperature of the places named for the month.

The average rainfall in October is 2 inches on the east coast, 3 inches on the south coast, and 4 inches on the greater part of the west coast.

THE RED LEAF AGAIN: A REPLY.

By G. W. Bulman, M.A.

I HOPE Mr. Tansley will forgive me when I say that I cannot find anything in his paper (Science-Gossip, June, 1888) which at all weakens any of the arguments drawn by me from a red leaf, and from my observation of the habits of bees (Science-Gossip, October, 1887).

In fact, I find in it admissions and quotations from the authorities which fully confirm my general proposition, viz. that red and blue flowers are not developed by the selective action of bees.

In the paper referred to, I drew two conclusions from the red leaf:

(1.) That a brilliant red might be developed in a plant without the selective action of insects.

(2.) That bees were not attracted merely by a red colour in a plant.

With regard to the first, I do not wish to exaggerate its importance in connection with what I will call for shortness the bee-selection theory: it does not prove the theory impossible, but it does show that it is not necessary. If a brilliant red leaf can be otherwise produced, why not a flower? And it is believed by the advocates of the theory in question that coloured petals were originally green leaves.

As Sir John Lubbock expresses it: "I believe . . . . that all blue flowers have descended from ancestors in which the flowers were green; or, to speak more precisely, in which the leaves immediately surrounding the stamens and pistil were green." ("Ants, Bees, and Wasps," p. 308.)

As to Mr. Tansley's quotation from Dr. Sorby, I cannot understand how it is supposed fully to meet my objection. It is simply a statement that the colouring matter in the petals of flowers is often the same as in the leaves, and that in "many crimson, pink, and red flowers," the development of colour "seems as if related to extra oxidation."

Looking at the red leaf, I say, "If this final result can be arrived at without selection, why not the red petal?" Surely the fact, that the colour is in both cases due to the same chemical changes, does not make the suggestion less probable.

And Mr. Tansley's own conclusions are that the development of coloured pigments in flowers and leaves is due to the same primary causes, but that the colours of the former are "stereotyped and perpetuated by insect selection." This is an admission of the conclusion to which my own arguments tended, viz., that colour in flowers is not developed by the selective action of insects. I suggested, that, since it could be fully developed in a leaf without insect agency, it might be so also in a flower: Mr. Tansley says, that "clearly" it is so.

I am aware that the development of colour by chemical action spoken of by Dr. Sorby does not exclude the idea of development by insect selection: it has nothing whatever to do with it. In any case whether insects have influenced the development or not, the colour is necessarily due to chemical changes. But the connection in which Mr. Tansley uses the word "development" seems to imply that the coloration of the flower was as completely effected as that of the leaf before insect selection come into play to stereotype and perpetuate it.

With regard to the "stereotyping" of the developed colours by insect selection, it is conceivable that this might occur if insects showed that critical appreciation of the colours of flowers with which some people credit them. I will return to this point when I come to my argument from the habits of bees with regard to different coloured flowers. In my former paper, however, I said nothing against this "stereotyping" theory. I was not even aware of its existence: my arguments were rather against such views as those expressed by Mr. Grant Allen in—for example—his paper on "Monk's-hood" ("Knowledge," September 29th, 1882). Speaking of the blue colour of monk's-hood, he says:

"Next, we may suppose, the large green sepals, being much exposed to view, began to acquire a bluish tinge, as all the upper parts of highly developed plants are apt to do; and the bluer they became, the more conspicuous they looked, and therefore the better they got on in competition with their neighbours, especially since bees are particularly fond of blue."

This is the sort of process I understand when I speak of the development of colour by the selective action of insects: it seems to me more in accordance with Darwinism than Mr. Tansley's theory, which seems to admit that the colour may be fully developed without insect selection, and is only stereotyped and perpetuated by the same.

But the red leaf may be supplemented, and the argument drawn from it strengthened, by the consideration of certain flowers, in the fertilisation of which bees may be supposed to have played no part.

Most people know the beautiful and brilliant little crimson flowers of the hazel. The conspicuous red part is the stigma, and Hermann Müller considers that this colour has been developed without any selective insect agency:

"From the structure of the flowers, and from insects never visiting the stigmas, I am convinced that the hazel is a strictly anemophilous plant; that the red colour of its stigmas is solely an effect of chemical processes connected with the development of the female flowers to maturity, just in the same manner as in the female flowers of the larch-tree and some other coniferæ." ("Nature," May 13th, 1875.)

Yet if insects had been observed visiting the flowers, the red would doubtless have been put down to their selective action.

Another case is that of the salad burnet (*Poterium Sanguisorba*). This plant bears its stamens and pistils on different flowers, and probably depends on the wind for fertilisation. The perianths of both kinds of flower are green, but in the one the stigmas are of a lovely pink colour.

Whatever, therefore, may be thought of the argument from the leaf, we have here conclusive proof that red may be developed in flowers without the selective action of insects. It is true, it is the stigma which is coloured in both cases; but if this can be accomplished without insect agency, it is simple dogmatism to say that petals might not be so also.

Mr. Tansley's objection, that the red of the leaf is not fixed—although I do not exactly know in what sense it is not fixed—cannot be urged against these examples.

We have in them cases in which colour has been "stereotyped and perpetuated" without insect selection.

My second point, that bees are not necessarily attracted by red, is admitted as a thing obvious to all: its antagonism to the theory is evaded by the statement, that bees are not supposed to care for red and blue simply as colours.

"At any rate, whether bees prefer blue and red to other colours or not, I suppose no one has ever asserted that they do so in an æsthetic sense. The contention of the upholders of this theory is rather that they have learned to consider blue or red as an index of high specialisation; and therefore of flowers . . . presenting peculiar adaptations for their visits."

With these words as it appears to me, Mr. Tansley deals a death blow to the theory he is defending. If the bee only goes to a blue flower because it has learned by experience that these are specially adapted for its visit, it cannot have had any share in the development of the colour.

Let us go back for a moment—in imagination—to the time, when, according to the theory, flowers had not yet become blue. The bees' taste for blue, being simply the result of experience, does not exist. So the few flowers with a chance shade of blue, among the green, white, yellow, red—whichever we assume they were—are not specially selected by the bees visiting the blooms for honey, and do not obtain any advantage: the chance variations towards blueness, not conferring any benefit, are not seized upon by selection—they disappear.

How are the bees to be guided to the particular flowers of Mr. Grant Allen's Monk's-hood which "began to acquire a bluish tinge," if their taste for blue is a thing still to be acquired? In fact, should the above statement be accepted, my arguments are superfluous: the whole theory collapses under Mr. Tansley's assertion.

But is it true, that no one has asserted that bees prefer blue in an æsthetic sense—that is, I infer, simply as a colour?

I will leave the following quotations from Mr. Grant Allen to speak for themselves.

Hyacinths are said to "have acquired a blue pigment to attract the eyes of azure-loving bees."

"Bees are particularly fond of blue."

Of the beetle, it is said, "he has certain special tastes for certain special hues and blossoms," and "It receives a sense impression from the bright hue of a flower, and is irresistibly attracted towards it, as the moth is to the candle."

I think the author of the above would wish to apply these generalisations as to the beetle's tastes to the bee likewise. Further observations have simply strengthened the conclusion.

The conclusion I drew from my observations respecting the flowers visited by bees, was, that the latter did not specially select red and blue—that they showed no preference for these colours in flowers.

(*To be continued.*)

SCIENCE-GOSSIP.

The editor of "Scientific News" gives the following good wrinkle:—"The marsh rosemary (*Ledum palustre*), otherwise known as Labrador tea, is a shrub growing to the height of three feet or four feet. It grows in swampy districts, in the north-west of Ireland and Scotland, in the countries around the Baltic, in Siberia, and the Dominion, especially Labrador. The alcoholic extract of its leaves has a very peculiar but not absolutely disagreeable smell. If it be diluted with water, and applied to the skin, no sand-fly, mosquito, etc., will, to the best of our knowledge, settle on the person thus protected. We have heard of this remedy and of its efficacy so

long that we do not remember who first discovered and applied it. Mr. Brown is right concerning the disagreeableness of 'F. B.'s' lotion; but we must remember, after all, that the bite of a mosquito may mean the injection into the system of the poison of yellow fever or of malaria."

DR. J. E. TAYLOR, editor of SCIENCE-GOSSIP, commenced his season for popular science lectures at the Colchester Students' Association on September 26th, with a discourse on "Flowers and Fruit; their History and Origin."

THE annual exhibition of the South London Entomological and Natural History Society will be held on the 17th and 18th of October, at the Bridge House Hotel, London Bridge, S.E. Many complaints having been made, owing to the difficulty of seeing the exhibits through the crowded state of the rooms, it has been decided to call the evening of the 17th of October a "private view," for which complimentary tickets will be issued to the exhibitors and the press, and a limited number will also be issued at a fee of one shilling each on the 18th of October.

THE International Geological Congress, which assembles every three years, met this year in London, on September 17th, under the presidency of Professor Prestwich. The last time it met was in Paris. Excursions were arranged on the 24th of September, to the Isle of Wight, North Wales, Norfolk and Suffolk, the Jurassic rocks of Central England, and West Yorkshire, for the purpose of examining the special geological features of those districts. These were under the direction of Messrs. Whitaker, J. S. Gardner, Professor Keeping, Professor Blake, Dr. Hicks, Dr. J. E. Taylor, Messrs. G. Morton, Woodhall, Lamplugh, F. W. Harmer, Clement Reid, Marr, Tidderman, A. H. Green, H. B. Woodward, &c.

WE have much pleasure in drawing attention to the capital portrait of the well-known Rev. Dr. Dallinger (with short biography) in the last number of the recently issued but vigorously edited monthly scientific journal, "Research." We are genuinely sorry to hear that Dr. Dallinger has at length retired from his useful (if not fitful) post of Governor of Wesley College, Sheffield. No man has ever done more to polarise Wesleyan Methodism with a love of God's works than he has.

AT the recent meeting of the American Association for the advancement of science, the chief feature was a paper by Professor Hall on the "New Psychology," in which he stated that hypnotism was one of the most promising areas of modern psychic research.

GERMANY has lost perhaps her greatest physicist, by the death of the distinguished Dr. Clausius, at the age of sixty-six. He will probably be best known to students by his researches and publications on heat.

DEATH has been very busy with our scientific men the last few weeks. Among the chief and best known is a man who has done more than a regiment of ordinary scientific men to make science understanded of the people, Mr. R. A. Proctor, the distinguished astronomer, astronomical writer, and lecturer, and editor of "Knowledge," at the comparatively early age of fifty-three. Poor Proctor!

ANOTHER valued old contributor to SCIENCE-GOSSIP, has joined the majority; Mr. Philip Henry Gosse, F.R.S., the zoologist, died at his residence, Torquay, at the age of seventy-eight. He was the author of works on the Natural History of Canada and Jamaica, the result of his personal investigations, besides others on British Zoology. He devoted himself in his later years to the microscopic study of the British Rotifera. The last scientific communication he penned was the short paper on the "Boar-fish," which appeared in the September number of SCIENCE-GOSSIP.

ANOTHER old and valued friend is also gone—Mr. Henry Stevenson, F.L.S., the author of the two raciest volumes in all ornithological literature, "The Birds of Norfolk." He was only fifty-seven.

Is there anything more painful than to be the brief biographer of friends with whom are associated, in the past, happy days and sunshiny hours? Poor W. H. Baily, the author of "Characteristic British Fossils," acting palæontologist to the Geological Survey of Ireland, professor at the Royal Dublin College of Science, contributor of many articles to SCIENCE-GOSSIP, is also dead. He was a contemporary of Edward Forbes, and De la Beche, and John Philips.

HOW electrical science has grown is best proved by the fact, that five millions of people are now dependent on the electric current for their daily bread!

ACCOUNTS of the marvels revealed by the great Lick telescope come to us from California. The ring nebula in the constellation of Lyra has been specially under examination by the aid of the thirty-six-inch refractor. The refractor in the Washington Observatory, in 1874, revealed thirteen stars outside and one inside the ring. But the Lick telescope shows twelve stars inside, and reveals "a corner of the universe where the great work of creation is now actually in progress." "Here," writes an observer, "in this cosmic workshop of Lyra are scattered raw materials and finished solar bodies; rows of suns ablaze with pristine light, and masses of unformed vapour, in whose bosom the carbon atoms may be floating which in the ripeness of time shall assume forms of beauty and life."

PROFESSOR PIAZZI SMYTH has resigned the office of Astronomer-Royal for Scotland, which he has held for forty-three years.

"NATURE" of August 30th, says that Mr. John Tebbutt, Windsor, New South Wales, picked up Encke's comet on the evening of July 8th! What has he done with it?

THE use of electricity was the subject of a brilliant address by Professor Ayrton at the meeting of the British Association. The Professor insisted on the great and undoubted future of electric power, and suggested that the time will even come when coal will be burned at the pit mouth for the purpose of creating mechanical energy at towns distant from the coal fields. Ere long he thinks it will be cheaper to carry electricity along a wire than coal along a railway. England would then resume her green and beautiful appearance, electric machinery at the pit mouth supplying power and light to distant parts. Electricity is at present produced by the burning of coal in the steam-engine. Professor Ayrton fancies that eventually electricity may be obtained by the burning of coal direct, without the agency of the steam engine, just as it is already obtained from galvanic batteries by the direct consumption of zinc. In America, says the Professor, there are already twenty-two electric tramways, while in England there are only four. In America there are six thousand electro-motors working machinery, while in Great Britain there are scarcely one hundred. The new mountain railway at Lake Lucerne is worked by electricity produced by the river Aar, three miles away. Electric trains, it is said, will never come into collision, as they can be so arranged that one train cannot get upon the section occupied by another without losing its current. At present, when a train stops at a station, the steam which drives it is largely wasted. When the electric train stops its energy will simply fly along the track for the use of distant trains which are moving. The eloquent Professor waxed warm with enthusiasm for a power which produces energy in the day-time and light at night. Even heat in time is to be supplied by the agency of the fluid which has recently flashed brilliantly in our autumn skies.

IN his paper on the Graphophone, read at the British Association meeting, Mr. Edmunds stated that Professor Bill and Mr. Tainter had found that tinfoil, as used in that instrument, was far too pliable for the purpose, as it always had a tendency to pucker and destroy the symmetry of the sound-waves. They perceived that no good result could be obtained by merely indenting a pliable material; it was necessary to engrave a record in a solid resisting body; and this discovery enabled them to produce a really practical instrument, which they termed the "Graphophone." Instead of tinfoil, Mr. Tainter employed wax, ploughing out, by means of a vibratory stylus, a narrow undulating groove, which constituted a sound record. Mr. Tainter has brought the experience of many years to the perfection of the Graphophone. The pith of the invention appears to be the "recording cylinder," six inches long by an inch-and-a-quarter broad, formed of cardboard, coated with wax. This is placed in a small lathe and rotated by a treadle in contact with the "recorder," which consists of a metal frame supporting a thin mica diaphragm, in the centre of which is a steel point that cuts a narrow groove on the surface of the cylinder, according to the quality and intensity of the sound spoken against it. The recorder is then removed, and replaced by the "reproducer," a light feather of steel that travels along the grooves made on the cylinder, and transmits their undulations to a small mica diaphragm, which in its turn communicates its vibrations, as sound-waves, to the ears of the auditor by means of two india-rubber tubes, for Mr. Tainter found it best to reduce the size of the record, and concentrate the sound in this way, on account of the greater distinctness that was thus secured. The manipulation of the Graphophone is very simple. It requires no adjustment, no electric motor, no galvanic battery. The foot supplies the motive power, and the machine regulates its own speed by means of an ingenious, but simple governor. Journalists and reporters may dictate their articles and reports, leaving others to transcribe them. The principal of a firm can speak his day's correspondence into the machine, which will repeat it sentence by sentence, to be written down in proper form by the clerk. Purely verbal communication can be carried on through the post by means of the record cylinders, which are extremely light, although capacious enough to hold one thousand words apiece.

MICROSCOPY.

NEW SLIDES.—We have received from Mr. J. Sinel, Jersey, a set of admirably mounted and most useful zoological slides as follows:—1. Section of sponge (*Sycon*) showing monads; 2. Longitudinal section through an expanded sea-anemone (*Bunodes*); 3. Transverse section through sea-anemone (*Tealia*); 4. Expanded zoophytes (*Campanula angulata*), with parasitic diatoms; 5. Section of compound ascidian (*Leptoclinum*); 6. Eye of Sepia. The sponge slide and that of *Campanularia* are unusually good, even for Mr. Sinel.—Mr. Ernest Hinton has forwarded us an exquisitely neat and cleanly mounted slide of a scale-moss (*Geocalycea*), showing the antheridium and archegonium. The two latter are curiously connected in a chalice-like crown at the summit of the shoot, and they are mounted in their natural position. This specimen is from Chapel le Dale, Yorkshire.—Mr. Walter White, Litcham, Norfolk, has forwarded us specimens of his botanical preparations which he offers at the low price of six for a shilling. They are marvels of cheapness as well as of neatness, and

have been specially got up for students of "Sack Thorne" and other botanical manuals on vegetable physiology. Mr. White's list includes no fewer than 180 such illustrative slides. Whilst speaking of such aids to biological students, we would draw attention to the preparations and specimens of Mr. W. K. Mann, of Bristol, whose catalogues collectors would do well to obtain and study. All instruments for egg collecting and preparation are offered by him, as well as collections of all sorts of insects, shells, birds' eggs, skins, &c.—From Messrs. Bolton, of Birmingham, may be procured mounted specimens of a vast number of algæ, infusoria, rotifera, polyzoa, &c., for students' uses.

THE ROYAL MICROSCOPICAL SOCIETY.—In addition to the usual welcome summary of current researches relating to zoology and botany, the August part of the journal of the above society contains a lengthy and highly elaborate paper (well illustrated) on "Additions to the Knowledge of the Carboniferous Foraminifera," by the Rev. Walter Howchin, F.G.S.

MEASUREMENTS BY CAMERA LUCIDA.—The books that R. W. has are quite correct when they state that the microscope when horizontal, that is, the eye looking through the camera lucida, must be 10″ from the table, or, rather, the paper on which the drawing or measurement is to be made. R. W. is quite wrong in his surmise, that the distance from the paper should vary with the distance between the object and the eye-piece. When we say a drawing magnifies so much, we mean that it magnifies the appearance of an object at a certain distance so much, and this distance for microscopic purposes is by general consent 10″. A man at a thousand yards appears a very different size to what he does at a hundred yards. If we have a drawing which states that a man is magnified so much, we must know at what distance the man is supposed to be. If we place in the horizontal microscope a scale of hundredths of an inch, and looking vertically down through the camera lucida on a piece of paper at 10″ from the eye, see that three of the divisions equal one inch, we then know that the picture we see or draw magnifies the object $\frac{100}{3} = 33$ times nearly, supposing the object to be at 10″.—*F. Le Grice, Colonel R.A., Shorncliffe.*

ZOOLOGY.

ANODONTA CYGNEA, LINNÉ.—In the September number of SCIENCE-GOSSIP Dr. Williams states concerning the form *Anodonta anatina*, Linné, that, "Anatomical differences apart, there is enough (he does not say what) in the shell to warrant us in still holding on to it as a good species." He has just before said that Dr. Henry Woodward's statement to the contrary was "uncanonical." If reference be made to the principal authorities on this subject, it will be found that they by no means endorse the opinion held by Dr. Williams. Messrs. Forbes and Hanley,* who were naturalists in the highest sense of the word, mention the name "anatina" as belonging to a variation in the form of the shell of *Anodonta cygnea*. Isaac Lea,† who made a life-long study of the unionidæ, and added more species to this family than any other man, says, when speaking of the point in question: "I have after a good deal of consideration and examination of my specimens, and the figures in numerous works describing the unionidæ, satisfied myself that *An. cygnea* and *An. anatina* are not specifically distinct." Dr. Paul Fischer again, in his "Manuel de Conchyliologie" (p. 197), has quoted, without amendment, from Dr. Gwyn Jeffery's book,‡ the number of species in the genera of British land and freshwater mollusca, two species of anodonta being enumerated, but when speaking of the distribution of this genus, Dr. Fischer says there is but "one European species."§ Turton and Gray held the same opinion, the latter agreeing with Forbes and Hanley ‖ that not even good varieties could be made from the variations of the freshwater mussel. Surely in the face of authorities such as these it is, to say the least, premature, to raise the charge of "uncanonical," for the *onus probandi* rests with those who hold the contrary opinion. The whole difference between the shells of the "two types" so-called, can be summed up in this. The ventral margin is approximately parallel to the hinge line in the typical cygnea, while in the other form the hinge line, and the approximately straight line of the ventral margin, if produced will meet on the anterior side of the shell. On turning to the descriptions of these forms in Dr. Williams's Handbook, no anatomical differences are to be found noted, though the author of it in the article mentioned above seems to consider that they exist. The shell of cygnea is described as "oval," that of "anatina" as "elliptical-oval," one fails to see any essential difference. Again the cygnea shell is called "dull green," that of the other form, "dark-olive-coloured;" now the largest specimen of anodonta in my collection (six inches from anterior to posterior margin) which undoubtedly is cygnea is dark-olive-coloured, while another specimen which is a very good example of the variation is dull green. Any one who has collected and examined fresh-water mussels knows that there is every conceivable intermediate form between the typical cygnea and the so-called species anatina, and that the shells vary in many ways besides, according to their environment. A very good way to obtain evidence bearing on the

* "British Conchology," vol. ii. p. 159.
† "Synopsis of the Family Unionidæ," p. 76.
‡ "British Conchology."
§ "Manuel de Conchyliologie," p. 1002.
‖ "British Conchology," vol. ii. p. 156.

question has been suggested. Take the fry, say of a typical cygnea, and place batches under different conditions. If on growing, all develope into typical cygnea, it will be something of an argument in favour of Dr. Williams's theory; if on the other hand some take the "anatina" form, it is proof positive that this is merely a variation. The futility however of recklessly creating varietal names seems at last to be dawning on Dr. Williams's mind, if one may judge from the concluding sentences of his article. "There must be some hard and fast line drawn in naming varieties, or we shall all be overwhelmed in a deluge of variety names." The "we" evidently refers to those who acknowledge and make worthless varietal names, and they will be the only ones to suffer, since every true naturalist discreetly ignores the products of their wasted energy. The case of the variety-monger and varieties is parallel with that of Dr. Johnson and strong-drink. "I can abstain," said he, "but not be temperate." To what can Dr. Williams's welcome change of opinion be referred? Can it possibly be due to the experience of his "Slug Gossip"?—*Wilfred Mark Webb.*

The Social Instinct in the Rabbit.—Some few years back a curious instance of this universal and most wonderful of instincts, which even at times influences our fellow creatures in the sense refined, came prominently beneath my notice. To amuse my little nephew and nieces a rabbit hutch was procured. What became of the majority of the occupants is sad and hard to tell, but out of the batch one eventually remained, which by way of a treat was from time to time let loose to gambol on the turf. Within that rabbit bosom the fraternal yearning smouldered true; he began to run round and round a little, every living thing does; and then he fairly ran round my father's legs while mowing with the mowing machine. The next followed the nursery maid out into the road, was twice captured madly scampering up Church Hill, and finally one Sunday morning, he or she, fairly followed the congregation into the church. As in the episode of Sir Launcelot, more could not be tolerated from a rabbit.—*A. H. Swinton.*

Pallas's Sand Grouse (*Syrrhaptes paradoxus*).—A male of this bird was shot at Kenmoor, near Yatton, Somerset, in the early part of July. The bird was verified by Mr. Charbonnier, taxidermist, Clifton. (Perhaps this may be of interest to your readers.)—*H. A. Francis, Clifton.*

Galls on Ground Ivy.—The galls on leaves of ground ivy are the work of the gnat *Cecidomyia Bursaria*, Bremi. Mr. E. A. Fitch, in his account of the Galls of Essex ("Trans. Essex Field Club," vol. ii. part 6), thus describes them: "Small, hairy, tubular galls, occurring in some numbers on the upper sides of the leaves. When mature, the galls readily fall from the leaf, leaving several round holes in it. The single pale yellow larva pupates within the fallen gall." I have occasionally found them about here, but I think they are not very common.—*Reginald W. Christy, Chelmsford.*

Ground Ivy.—The excrescences on *Nepeta glechoma*, noticed by F. H. W. in the September issue, are the galls of *Aulax glechomæ*, a hymenopteron. They appear to have been specially abundant this summer.—*E. Step.*

Vanessa Antiopa in Kent.—On August 22nd, I received a letter from my friend, Mr. J. Wood, of Chatham, written the day previous, stating: "To our great surprise this morning, we saw a Camberwell Beauty in the garden, feeding on an over-ripe gooseberry which had fallen from the bush. We watched it for some time, it looked so beautiful. It flew up, and actually settled on me, and then on my sister." Upon receiving this news, and knowing the habit the Vanessidæ have of returning day after day to sweets, I arrived at my friend's house about mid-day, and was glad to hear it had been again feeding upon the gooseberry that morning, and I had the fortune to secure it, while settled on a gravel walk. It is a fine specimen, $3\frac{3}{16}$ inches in expanse, and very richly coloured; the margins are of a straw-yellow colour. With the exception of the margins being slightly chipped, it apparently was freshly emerged.—*F. W. Frohawk, Balham, S.W.*

BOTANY.

Botanical Examination.—I have often heard students who have failed in their examination lay all the possible blame on the examiners, who are singularly unfair to these same sad students, but I do not remember one before, rushing into print to air his grievances. To shew that I am not writing this because I happen to have been successful, I may tell "Inquirer" that I am just as disappointed in Biology in the late examination, as his friend is in Botany. As to the questions he asks, I may say that, in my opinion, there is no available way of obtaining official answers to his, to say the least, singular queries. As one who has sat some fifteen or sixteen times at the Science and Art Department Exams., I may be allowed to answer these questions to the best of my ability: (i.) The examiners do not require a candidate to have passed all the previous stages before granting a pass in honours. (ii.) The stupidity of the question forbids my answering it. (iii.) I do not think the number of passes is regulated by the amount of grant, for many external students sit the exam. and no grant will be claimed upon their success. (iv.) It is not so difficult to pass in some subjects as in others, *e.g.* one can more easily take honours in agriculture than the

same stage in either mathematics or botany. (v.) The form attached to the answer paper does not go before the examiners, for, on the paper of questions it is distinctly printed, "Your name is not given to the examiners, and you are forbidden to write to them about your answers." (vi.) The candidate's previous highest success is asked for, I should say, for the purpose of determining the amount of grant to be paid for the candidate's present success. (vii.) Age and profession have nothing to do with the examination, but I do not think there is anything unusual in asking one for these particulars. (viii.) No; each should have an equal opportunity. I do not agree with "Inquirer" that the whole scheme of the Department will become "a farce and a failure" should his questions not have been answered. It is not in the method of examination, nor in the honesty of the same, that the Department is in fault, but in the method by which it encourages the teaching of science. It should not allow students to take up a science until they have been grounded in the truths that lead up to that science—thus, a knowledge of physiology is indispensable to the study of hygiene, and Professor Huxley himself says that many candidates in physiology fail because they have no knowledge of chemistry or physics. A question in the House of Commons could be asked with more propriety on this Departmental stupidity than about an individual failure in honours botany.—*Chas. A. Whatmore.*

The Sunflower.—Mr. Lett says: "If it were the case that the sunflower every twenty-four hours twisted its peduncle and brought its flower constantly towards the sun, every sunflower in every garden would be found facing in precisely the same direction, a fallacy needing no refutation." The fallacy is however not in the poetry but in the argument, which would never have been used by any person fully acquainted with the tendency of plants to vary, which variableness affords a necessary basis for selection whether natural or artificial. When Dr. Darwin said that seeds yielded by flowers that had been self-fertilised gave origin to plants less vigorous than those which were cross-fertilised, he admitted that the results of his experiments were not uniform, and that he noticed some conspicuous exceptions. In like manner, a phenomenon which has been observed in sunflowers for many generations is none the less true because it did not appear in the plants selected for observation by Mr. Lett. It may be questioned if the term peduncle can be rightly applied to the flowering stem of the sunflower, on the top of which the capitulum stands and which is indeed the central axis of the plant bearing leaves up to the base of the receptacle itself. Remarkable for its rigidity when blown aside by a storm like that of the 28th August, the roots of the plant are loosened in the ground, but the stem in its lower part remains straight as a yard measure made of wood. The upper portion of the stem being as flexible as the base is rigid, turns towards the zenith, and assumes an erect attitude whatever be the angle at which the lower portion of the stem is inclined. If after this the plant be raised and fixed to a support, the stem regains its rectitude by straightening the bend made in its upper part. This is of course providing that the raising of the plant be done before the stem has lost its flexibility in the part which had been bent. When the flowering time approaches and the capitulum begins to incline towards a lateral rather than a vertical aspect, its inclination tends to follow the sun just as the summit of a fallen plant turns up towards the zenith: this inclination continues till the flexibility of the stem ceases in its upper as it had previously ceased in its lower part, and the entire plant becomes rigid. I think Mr. Lett was unfortunate in his choice of the largest flower-heads, as they would be most likely soon to lose what flexibility they had and become rigid.—*John Gibbs.*

Carduus Setosus.—It may interest some of your readers to hear that this variety of *C. arvensis* has been found near Cirencester. Bentham mentions it as having been found in the county of Fife. Does it grow in other parts of Britain?—*F. E. Z.*

"Annals of Botany."—The August number of this valuable scientific serial contains the following papers:—"*Arceuthobium oxycedri*" (with plate), by T. Johnson; "On the Development of the Aleurone-Grains in the Lupin" (with plate), by A. B. Rendle; "On the Structure of Spongocladia, Aresch (Spongodendron, Zanard), with an account of New Forms" (with woodcuts), by George Murray and Leonard A. Boodle; "Notes on the Geological History of the recent Flora of Britain," by Clement Reid; "Recent Researches on the Saprolegnieæ; a critical abstract of Rothert's results," by Marcus M. Hartog; "Illustrations of the Structure and Life-History of *Puccinia graminis*" (with plates), by Ward H. Marshall. Also the following notes:—"On the Systematic Position of Isoetes" (second note), by S. H. Vines; "On the Occurrence of Starch in the Onion," by A. B. Rendle; "A Modification of Pagan's Growing Slide" (with woodcuts), by Selmar Schonland. The plates are up to their usual artistic mark.

GEOLOGY, &c.

Flint Implements.—A beautiful collection of flint implements (neolithic), including finished and unfinished, polished and unpolished borers, scrapers, hammers, flakes, &c., has recently been presented to me; but the donor can give me no further information than that they were picked up on the chalk downs

near Eastbourne. They are patinated and white, resembling the ordinary fractured flints found on the downs. No text-book, or treatise on flint implements appears to mention flint implements as found in abundance on the downs, and they are dissimilar to those, few and far between, found on the Wiltshire downs. It is just possible that a record of these may be of public interest, and I am anxious to rescue the history and origin of this collection from oblivion. I shall be grateful for any notes or references on the subject.—*A. S. Eve*, *Marlborough College.*

NOTES AND QUERIES.

PIN-HOLE PHOTOGRAPHY. — In the excellent "Dictionary of Photography" now being weekly published in the "Amateur Photographer," Mr. E. J. Wall says: "Of late years the possibility of taking passable negatives without the use of an ordinary camera and lens has become an established fact. For this purpose any rectangular box which is absolutely light-tight will do. In one end make a minute hole with the point of a needle, and at the other end place the sensitive plate, keeping it in its place by means of a clip or other simple arrangement. A prolonged exposure is required about twenty or thirty times the ordinary one, for any given subject. No focussing is required, as the image is always fairly sharp, no matter what distance the plate is from the hole. The larger the plate the wider the angle, and the greater the distance, the larger the image. As an experiment it should be tried by every amateur, as the materials are always at his command in the shape of an empty plate-box."

SACCHARINE.—Replying to the query of Rev. H. Whittaker in July issue: Roughly speaking, diabetes is a form of disease by which all foods are turned into a sugar, and passed away without nourishing the body. The great effort of the physician is therefore to provide food for the patient having no sugar in it to aggravate the complaint. Saccharine is merely a sweet taste, being a mineral product, it could not assimilate, and was believed to pass out of the body unchanged. This view has now been challenged by some leading French scientists, who assert that when it does not assimilate, it also does not pass away, but remains in the body to accumulate, in which case it would not be desirable to use it for any purpose whatever. I may further mention that Government prohibit its use for brewing, and Somerset House authorities have just announced their success in finding a good test for detecting its presence.—*G. H. Wicks*, *Bristol.*

WHAT INSECT?—Will any reader of SCIENCE-GOSSIP tell me the name of a dipterous insect, about as large as a blue-bottle fly, wings transparent, with curious clouded appearance, in irregular patches of smoke colour, eyes of splendid colour, red, yellow, and green, in varied lights.—*C. P.*

TENNYSON'S NATURAL HISTORY.—In SCIENCE-GOSSIP for June, page 139, E. H. V. inquires whether snipe hum? In dear old Gilbert White's Natural History of Selborne (letter to Thos. Pennant, of August 4th, 1767), the following passage occurs: "Numbers of snipes breed every summer in some moory ground on the verge of this parish. It is very amusing to see the cock bird on wing at that time, and to hear his piping and humming notes." Unfortunately I have no personal knowledge which would help in answering E. H. V.'s query; and I shot, for snipe shooting is common out here where the rice-swamps which are within very easy distance of this city, afford splendid shooting. Tennyson may, like Gilbert White, have heard the humming notes of the snipe. I know that whenever wild birds pass over this city at night, in the migrating season, their shrill notes among the clouds always recall Tennyson's line about the "birds that change their seasons in the night." I think his description of a tropical island, "the mountain wooded to the peak," and so on, in "Enoch Arden," is wonderfully accurate, and in its own line usurpassed in poetry. By the way, some of our water birds, snipe, &c., are said to come to the swamps in Lower Bengal from Thibet, and to do the long journey in a single night. I have also heard that for two or three seasons, a water-bird only found in Central Asia, visited one particular pond in our Zoological Garden. It came during our cold weather, and stayed only a few days. Whether it was the same bird which came year after year, I do not know; but the presumption seems to have been that it was. This is a very gossiping note, but scientific gossip is admissible in your columns!—*W. J. Simmons*, *Calcutta.*

RUDIMENTS.—I notice that your correspondent challenges a defence of the word rudimentary. I should be sorry to be understood as speaking *ex cathedrâ*, but having given some little passing attention to the comparative anatomy of the arthropods, and observing that certain difficulties which possibly predonderate with your lady writer lie without the department of human anatomy, I must in courtesy be forgiven if, as a matter of feeling, I beg personally to differ as regards any lachrymose conclusions, and I sincerely trust any remarks of mine may be as kindly received as they are indeed conceived. The word rudimentary, according to Dr. William Smith, the classical lexicographer, is derived from the Latin adjective *rudis*, in a natural state, not improved by art, hence unwrought, untilled, unformed, rough, raw, wild; and in the present sense I conclude unspecialised; but let us hear Dr. Darwin himself, who thus writes to Sir Charles Lyell from Ilkey, Yorkshire, under date of the eleventh of October, 1859 ("Life and Letters," vol. ii. pp. 213–14). "On the theory of Natural Selection there is a wide distinction between rudimentary organs and what you call germs of organs, and what I call in my bigger book 'nascent' organs An organ should not be called rudimentary unless it be useless—as teeth which never cut through the gums—the papillæ, representing the pistil in male flowers, wing of Apteryx, or better, the little wings under soldered elytra. These organs are now plainly useless, and *à fortiori*, would be useless in a less developed state. Natural Selection acts exclusively by preserving successive slight, *useful* modifications. Hence Natural Selection cannot possibly make a useless or rudimentary organ. Such organs are solely due to inheritance (as explained in my discussion), and plainly bespeak an ancestor having the organ in a useful condition. They may be, and often have been, worked in for other purposes, and then they are only rudimentary for the original function, which is sometimes plainly apparent." If the biography of genius affords any proof that form and comeliness is indicative of inward enlightenment, I for one should hail with pleasure the future development, but as regards naturalists it is not always thus. In the case of my deceased friend

Mr. Henry Waring Kidd, who wrote the article on Fasciated Stems in SCIENCE-GOSSIP (vol. xix. pp. 196–198), these perfections never appeared at all. The article was written by the nurse from dictation, and as for his personal appearance, as his own relatives said, it would frighten any lady. He was a confirmed paralytic, hopped like the kangaroo and gesticulated like the baboon, and had no acuteness of either sight or hearing, I think; and yet had he been alive, I am almost sure he would have answered the query in SCIENCE-GOSSIP in respect to the cherry-galls on ground ivy, which are possibly those of *Cecidomyia bursaria* (Entomologist's Annual for 1872). He came however of a talented family.—*A. H. Swinton.*

FIELD VOLE.—This animal occasionally nests in crannies and holes of tree roots, and about hedge-bottoms, but the most common locality in my experience is a few inches below the surface in corn-fields, &c. The occurrence described by Mr. Head can scarcely be called unusual.—*J. A. Wheldon.*

GALLS ON GROUND IVY.—If not too late, I should like to see some of the galls mentioned by F. H. W. (p. 213); I am forming a collection of galls for my museum, and shall always be glad to have galls of any kind.—*S. L. Mosley, Beaumont Park Museum, Huddersfield.*

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.

F. W. H.—Get Staveley's "British Insects." We know of no popular elementary treatise on "Acari." See Mr. George's papers on the subject in past vols. of SCIENCE-GOSSIP (illustrated). For Diptera, consult the British Museum Catalogues, also numerous papers (illustrated) in past vols. of SCIENCE-GOSSIP.

WM. R.—"The Naturalist" is the accredited monthly journal of natural history for the north of England, and is published monthly at Sunny Bank, Leeds, price (with postage) 7*d.*

W. A. L.—We are open to accept good papers on the subject you mention.

A. BATES.—Your specimen is the female of the great saw-fly (*Sirex gigas*).

E. C. R.—You cannot do better than procure Sowerby's "Grasses," with coloured plate of every species. Stark's "British Mosses" would be the best for you.

H. SMITH.—See papers by the late Mr. J. F. Robinson on "Notes for Science Classes," as to cutting and mounting botanical objects, in SCIENCE-GOSSIP for 1883.

T. MILLIE.—You can learn very much of astronomy indeed without a teacher. Get "Planetary and Stellar Studies," by J. E. Gore (London: Roper and Drowley), just published; or any of Mr. Proctor's works, star maps, &c.

J. A. HOGG.—The growth you enclosed is the gall of species of Cecidomyia.

C. HARRIS.—You cannot do better than take in the shilling parts of the work now being issued by Messrs. Gurney and Jackson (successors to Mr. Van Voorst), written by Mr. Howard Saunders. It contains illustrations of nearly every British species, with all the details you require.

L. KITCHING.—The fungus sent us is a species of the "Birds' Nest fungus" (Nidularia).

L. ALLEN.—We received your letter, but there was no plant enclosed.

G. O. DAY.—Stainton's "Manual of the Sineina," 2 vols., is the best yet out. We are not aware that Newman ever published on the micro-lepidoptera, beyond what you find in his "Moths."

T. F. HALL.—Mr. J. Sinel, St. Helier's, Jersey, would doubtless be able to help you to the special kind of knowledge you require.

EXCHANGES.

DRAGONFLIES wanted, fresh and unset preferred. Lepidoptera given in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

EUROPEAN butterflies wanted. British lepidoptera in return.—W. Harcourt Bath, Ladywood, Birmingham.

OFFERED.—Chalk and Thanet sand fossils. Wanted.—Micro apparatus or material, slips preferred.—Chas. L. Neil, Hamilton House, Goldsmith Gardens, Acton.

DEVONIAN corals (polished sections), unnamed. What offers in micro apparatus?—Chas. L. Neil, Hamilton House, Acton.

FOR exchange.—Micro slides and botanical objects. Wanted, natural history books, micro slides, or apparatus.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, "Carpenter on the Microscope." Exchange micro slides, land and freshwater shells, &c.—Ernest O. Meyers, Richmond House, Hounslow, W.

EXCHANGE.—Bicycle, rear-driving safety, Premier pattern, plated parts, balls, only once ridden. Offers, or would exchange for good double tricycle.—Chas. L. Neil, Hamilton House, Acton, W.

OFFERED.—"British Association Handbook," Manchester (Nat. Hist. Antiquities and Industries), pp. 108. Exchange for books, journals, or first-class slides (animal).—G. H. Bryan, Chaucer Road, Cambridge.

WILL exchange "British Medical Journal," 5 vols. unbound, from June 1883 to Dec. 1885, for books or periodicals, micro or nat. hist. apparatus, or offers.—G. H. Bryan, Chaucer Road, Cambridge.

MARINE algæ from the N.E. coast of Scotland, and N.W. coast of Ireland, in exchange for other marine algæ, English or foreign, mosses, lichens, or flowering plants.—E. M. Holmes, Bradbourne Dene, Sevenoaks.

DUPLICATES.—*A. adippe, A. euphrosyne, A. selene, G. rhamni, L. sinapis, H. thalassina, L. argiolus, T. rubi,* &c. Desiderata, dragonflies.—W. Harcourt Bath, Ladywood, Birmingham.

DUPLICATES.—*Helix virgata* and *H. caperata* from Llandudno, *Calopteryx splendens, C. virgo,* and other dragonflies. Desiderata, dragonflies.—W. Harcourt Bath, Ladywood, Birmingham.

DRAGONFLIES wanted from all parts of the British Isles, fresh and unset preferred. Natural history books and specimens offered in exchange.—W. Harcourt Bath, Ladywood, Birmingham.

OFFERED, gratis, to first applicant requiring same for school museum, or similar object, a box of fossils and minerals (about ¼ cwt.), a few hundred British, and a few dozen foreign shells. Recipient to pay carriage.—J. Sinel, Cleveland Road, Jersey.

WANTED, to exchange British plants for herbarium. Offered, rare duplicates, and a small collection of British lichens named and collected by the late Wm. Gardiner, of Dundee. Lists exchanged.—F. B. Webb, Church Terrace, Cheadle, Staffordshire.

WILL exchange Liassic fossils for British birds' eggs.—W. D. Carr, Lincoln.

Trigonia pulchella from upper lias, in exchange for other British trigoniæ.—W. D. Carr, Lincoln.

WANTED, plants from the west and south of India. Send lists to—E. de C. Crowcombe, Beckenham, Kent.

LANTERN slides (photo micrographs) of insect, botanical, and geological subjects, diatoms, &c., in exchange for micro slides, &c.—W. D. Stewart, 2 Gilmore Terrace, Edinburgh.

WILL exchange vol. i. of "Science for All," bound, good as new, for any of Darwin's works, or other science books.—W. E. Rider, Parker Street, Cambridge.

SHELLS: *H. virgata* and var. *submaritima, H. pisana;* desiderata very numerous. Land, freshwater, and marine shells duplicates the following. Eggs: partridge, magpie, rook, robin, willow warbler, whitethroat, missel thrush; desiderata very numerous. Insects: duplicates, amongst which are as follows, *lonicerœ* bred, *segetum, festiva, Brunnœ,* and many others; desiderata very numerous, especially butterflies and bombyces.—N. Hewett, 26 Clarence Street, York.

FOR exchange.—Foreign marine, land and freshwater shells, British birds' skins and eggs. Wanted.—Eggs and nests, foreign shells, British beetles, natural history books and pamphlets.—J. T. T. Reed, Ryhope, Sunderland.

NORTH American land shells in exchange for any British land and marine shells not in my collection.—Thos. W. Reader, 171 Hemingford Road, London, N.

GOOD foreign stamps offered for shells, fossils, or micro slides.—Thos. W. Reader, 171 Hemingford Road, London, N.

To egg collectors.—Will exchange a few puffins' eggs, with full data and side-blown, for others similarly blown.—D. Dennett, 13 Fernbank Road, Bradford, Yorks.

FOR leaves of *Deutzia scabra*, enclose stamped envelope; others if good material enclosed.—Dr. Martin, New Brompton.

P. glaber, *Bul. obscurus*, *V. piscinalis*, *H. arbustorum*, in exchange for other British land and freshwater or marine shells.—W. Dean, 50 Canning Street, Stoneyholme, Burnley, Lancs.

AMMONITES, belemnites and other cephalopods wanted in exchange for fossils, shells, rocks, minerals, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

FOSSILS from magnesian limestone, lias, &c., offered in exchange for fossils, shells, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

Helix fusca and numerous other British shells offered in exchange for other shells, fossils, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

I SHOULD like to correspond with naturalists in any part of the world, and especially in S. Africa, S. America, and Australia.—W. M. Roberts, F.Sc.S., Abergynolwyn, R.S.O., Merionethshire, N.W.

PRITCHARD'S "Infusoria," 1861, Ralfs' "Desmidiæ," 1848, Cooke's "Freshwater Algæ," 1882, Gosse's "Tenby," student's microscope, by Watson & Sons, condenser, live cage, &c. Exchange for books with illustrations by Cruikshank, Rowlandson, Leech, Alken, Phiz, sporting books, early editions of Dickens, "Titmarsh," and other popular authors. Lists invited.—F. W. N., 72 Victoria Road, Great Yarmouth.

WILL exchange clutches of coot, moor hen, great black-backed, lesser black-backed, herring, and common gulls, kittiwake, great skua, curlew, lapwing, ringed-plover, snipe, missel thrush, common, Arctic, sooty and Rüppell's ferns, mute swan, guillemot, razor bill, ringed guillemot, and puffins, for clutches of other species.—Commander Young, R.N., Rodwell, Weymouth.

WANTED, a bit of fresh stem of *Euphorbia splendens*; vegetable preparations offered in exchange.—Walter White, Litcham, Swaffham.

SOME of the best varieties of cerei, phyllocacti (various colours), stapelias, &c., in exchange for shells, cool greenhouse orchids, or offers.—E. R. F., 82 Abbey Street, Faversham.

WANTED, to exchange plants for herbarium. Lists exchanged.—E. C. Robinson, 46 Fishergate, Preston, Lancs.

I SHALL be glad to exchange land, freshwater, or marine shells, brass rubbings or curios.—Archibald Hy. McBean, S. Denys, Southampton.

PITCHSTONE and spherulite from Arran, in exchange for fossils or minerals.—E. Carrick, Sharon Street, Dalry, Ayrshire, N.B.

BEAUTIFULLY preserved sea-urchins (with or without spines), in exchange for British land, freshwater and marine shells, or insects.—T. W. Paterson, 18 Polwarth Crescent, Edinburgh.

WILL exchange British and foreign marine mollusca for fossils from Norwich, crag or pleistocene deposits.—W. A. Loydell, 20 Stanley Gardens, The Vale, Acton.

OFFERED.—"The Naturalist," Hobkirk and Porritts' series, Nos. 1–4, 6–13, 49–84. Wanted.—Land and freshwater shells, or eggs of British birds in clutches.—Chas. Oldham, Ashton-on-Mersey, Manchester.

FOR exchange.—Carrion crows, rooks, magpies, black head gulls, kittiwakes, puffins, guillemots, razor bills, jackdaws, willow warblers, hedge warblers, moor hens, partridges, ring doves, whitethroat, one Yorkshire leal, one sparrow hawk, two long-eared owls, &c.; some of above in clutches if required. Send lists of duplicates and desiderata to—E. G. Potter, 19 Price Street, York.

DUPLICATES.—Euonymella, psi, caia, grossulariata, salicis, pallens, ova of dispar. Desiderata very numerous.—F. W. Paple, 62 Waterloo Street, Bolton.

DUPLICATES, L. C., 8th ed.—5c, 27, 39, 40, 41, 64, 79, 81, 82, 85, 91, 137, 166, 176, 234, var. Floydii, 249, 273, 291, 317, 335, 336, 353, 356b, 372, 479, 494, 505, 514g, 514w, 543, 639, 680, 692, 774, 799, 808, 812, 859, 863, 865, 901, 910, 940, 944, 954, 966, 973, 1043, 1077, 1109, 1126, 1164, 1191, 1192, 1196, 1224, 1227, 1230, 1270, 1335, 1344, 1346, 1394, 1421, 1475, 1545, 1550, 1561, 1563, 1617.—A. Wheldon, Chemist, York.

IN exchange for six slides I will send forty varieties of animal hair.—Arthur H. Williams, Hythe.

WANTED, foreign butterflies or moths, either set or in papers; exchange duplicates of same, or fossils, shells or coins.—F. Stanley, 6 Clifton Gardens, Margate.

WANTED.—*Z. glaber*, *H. revelata*, *obvoluta*, *P. secale*, *A. lineata*, *B. perversa*, *U. tumidus*, *P. lineatus*, *glaber*, *L. glutinosa*, &c., in exchange for other land and freshwater shells.—T. A. Lofthouse, 67 Grange Road, Middlesbro'.

WANTED, pupæ or imagines of British or foreign lepidoptera; will give shells, &c., in exchange.—T. A. Lofthouse, Grange Road, Middlesbro'.

LIASSIC and magnesian limestone fossils offered in exchange for mountain limestone fossils.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

BRITISH and foreign ammonites wanted. Exchange fossils, &c.—John Hawell, M.A., Ingleby Vicarage, Northallerton.

WILL exchange Humboldt's "Travels in South America" (new), published by Bohn, for good copy of Carpenter on the "Microscope and its Revelations."—Francis Lannin, 1 Marlborough Terrace, Londonderry.

WILL exchange "Nature," bound volumes 23 and 24, or 25 and 26, in splendid condition, for Davis's "Practical Microscopy," in good condition.—J. Hunter, Sea View, Buncranna, co. Donegal.

WANTED.—Varieties of *Helix rotundata*, *Helix hispida*, except *subrufa*, *Limnea palustris*, and *Pupa ringens*. Offered.—*Pupa secale*, *Helix rupestris*, and *Carychium minimum*.—Miss Eyre, Swarraton Rectory, Alresford, Hants.

I HAVE a number of spare plates (coloured), as issued in my "British Birds," suitable for framing, which I should be glad to exchange for birds' eggs, or insects, British or foreign.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

WANTED, to correspond with collector who could supply *Ophiocoma filiformis*, *O. bellis*, *U. violacea*, *U. hispida*, *Echinus lividus*, *E. neglectus*, *E. placenta*, *Brissus lyrifer*, &c.—C. Jefferys, Warren Street, Tenby.

Helix obovulata, *Bulimus montanus*, *Pupa ringens*, *Testacella*, both species, and *Succinea oblonga* wanted. State return required.—C. Jefferys, Warren Street, Tenby.

Lutraria oblonga, *Solen pellucidus*, *Ianthina rotundata*, *Ovula patula*, *Solecurtus antiquatus*, &c., wanted. State returns required.—C. Jefferys, Warren Street, Tenby.

DUPLICATES.—*Andrena fasciata*, ♂, *Nomada borealis*, ♀, &c. Wanted, rare and local aculeate Hymenoptera.—G. E. Frisby, 6 Church Street, Maidstone.

WANTED, copy of Tate's "British Mollusks" (coloured plates), and copy of each of the 1875 and 1876 "Botanical Record Club" Reports.—W. Whitwell, 4 Thurleigh Road, Balham, S.W.

WILL exchange "An Arrangement of British Plants," sixth edition, 4 vols. (illustrated), by Withering, for a turntable, or illustrated books on British land and freshwater shells, or offers.—J. B. Beckett, Trinity Place, Friars Lane, Great Yarmouth.

WHAT offers for a collection of British marine, land and freshwater shells, named and localised?—J. B. Beckett, Trinity Place, Friars Lane, Great Yarmouth.

WILL exchange last year's SCIENCE-GOSSIP (December number missing) for fishing tackle.—Arthur Patterson, Yarmouth.

WANTED, a few hymn books, in fair condition, containing psalms and hymns with supplement, or otherwise, prepared for the use of the Baptist denomination. Will give British or foreign shells, fossils or minerals, or polished corals, Devonian specimens.—A. J. K. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTED, Wood's "Index Testaceologicus," complete. Will give a rare exchange in fossils, minerals, British and foreign shells, polished specimens of the Devonian corals and sponges (fine sorts), sections of corals for mounting (some very rare sorts).—A. J. K. Sclater, M.C.S., 23 Bank Street, Teignmouth.

BOOKS, ETC., RECEIVED.

"Planetary and Stellar Student," by J. E. Gore (London: Roper and Drowley).—"Entomology for Beginners," by Dr. A. S. Packard (New York: Henry Holl & Co.).—"The Geological History of the British Islands," by A. Jukes-Browne (London: Longmans).—"The Asclepiad."—"The Microscope."—"Scientific News."—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"Scientific News"—"Wesley Naturalist."—"Victorian Naturalist."—"Journal of Conchology."—"Cassell's Technical Educator."—"The Speaking Parrots" (part 5).—"Research,"—"British Dogs," by Hugh Dalzell (parts 22 and 23).—"Proceedings Bristol Naturalists' Society."—"Trans. Penzance Nat. Hist. Soc."—"Proceedings S. London Entomol. and Nat. Hist. Soc."—Trans. Hertfordshire Nat. Hist. Soc."—"Third Report, City of London Coll. Sci. Soc.," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 13TH ULT. FROM: C. P.—A. C. Y.—W. H. M.—B. M. C. B.—A. M.—M. C. L.—J. N.—W. H. B.—E. M. H.—G. H. B.—L. K.—J. B.—S. K. S.—W. J. S.—G. E. H.—W. L. W. B.—C. H.—K. L. D.—F. W. F.—E. E. L.—L. A.—W. L. W. E.—S. L. M.—G. O. D.—F. N.—W. W.—R. W. C.—G. E. F.—F. L.—A. J. K. S.—E. H.—H. A. F.—P. H. M.—C. J.—J. R. W.—J. S.—C. K.—J. C.—J. H.—W. D. S.—E. C. C.—R. H. R.—F. B. W.—G. W. R.—W. D. C.—S. W. R.—J. T. R.—F. W. A.—D. W. B.—J. I. N.—A. A.—W. H.—W. E. R.—J. W.—S. L. M.—W. O.—C. A. W.—J. H.—W. M. R.—F. E. Z.—W. D.—W. M. W.—J. B. Y.—F. W. H.—A. W. S.—H. S.—E. G. P.—F. W. P.—F. W. P.—E. C.—A. L.—A. H. M. B.—E. C. R.—W. H. W.—I. A. W.—W. W.—W. A. S.—C. O.—E. S.—E. R. F.—M. B. B.—F. W. N.—A. G. T.—J. A. H.—T. A. L.—A. H. W.—A. S. E.—L. F.—F. S.—H. W. B.—J. S.—C. D. B.—J. H.—J. M.—F. L.—T. F. H.—C. P.—H. L.—G. F.—R. S.—J. H.—J. H. W., &c. &c.

THE RED LEAF AGAIN: A REPLY.

By G. W. Bulman, M.A.

[*Continued from page* 232.]

I WILL now examine briefly the statements brought forward from the authorities against my views. On the whole, I cannot see that they affect my arguments at all — except, indeed, to strengthen them.

I instanced the common scarlet poppy, and the two periwinkles as very conspicuous red and blue flowers upon which I had never, or scarcely ever, observed bees. Mr. Tansley cites Hermann Müller to show that the former is visited by seven species of bees, the smaller periwinkle by the same number, and the larger periwinkle by one. I willingly accept these statements as facts. At the same time, I must put in the caution, that such statements as to the number of species of bees which have been noted as visiting particular flowers is apt to be misleading, if not carefully considered.

It is not the number of species visiting a flower, but the absolute number of blossoms visited, and thus receiving the benefits of cross-fertilisation which is important; the flower receiving the visits of only one species of bee may, in the long run, have a larger number of blossoms cross-fertilised than the one receiving the visits of seven. For example, I have compared the visits of bees to the white flowers of the chickweed and to the blue of a common speedwell (*Veronica Buxbaumii*).

In the garden where I made the observation, the former was growing thickly, with the latter scattered plentifully among it, and elsewhere. Speaking roughly, about one hundred chickweed flowers were visited for every one of the veronica: yet, during the period of observation, the former attracted two species of bee, and the latter three.

This fact also speaks not undecidedly on the subject of the bee's asserted preference for blue. Is it not strange, on the supposition of its truth, that the white flowers should receive more visits than the blue? On a rough calculation a bee visited about twenty chickweed flowers per minute: a score of bees at this rate would visit every blossom in the garden in the course of a spring day. And if, in a race of white flowers, practically every flower gets the benefit of a bee's visit, where is the advantage which those happening to have a tinge of yellow, red, or blue are supposed to obtain? It becomes a vanishing quantity: the uncoloured ones are equally benefited.

To return to the poppy and periwinkles, I must confess that the general impression derived from my observations remains the same. If, during an extended series of observations, many thousands of bees are seen on greenish, white and yellow flowers, and none or very few on such conspicuously blue and red ones as the above, I do, and must, draw the conclusion, that bees have no decided preference for red and blue flowers. I do not infer, and do not wish any one to infer from the fact, that I have never seen a bee on a particular flower, that therefore it is not visited: it is the comparative number of visits which is the point.

The habits of bees with regard to those blue flowers which have white and other varieties is decisive as to their taste in the matter of colour.

I have noticed them on the flowers of the forget-me-not, where blue and white varieties grew together: they pass with seeming indifference from blue to white, and from white to blue.

Among garden hyacinths, where blue, pink, and

white grow together, I can distinguish no preference for any of these colours.

One more example of the habits of bees in connection with different coloured flowers of the same species, and I will spare my readers—who have not already spared themselves.

It is the transcript of a leaf from my note-book.

Here is a patch of the *Sun cistus*, or rock rose (*Helianthemum vulgare*), with red, yellow, and white flowers.

Three yellow blossoms are separated from five white ones by one red; to the right are a large number of red flowers.

Bee No. 1 visits all three yellow flowers, the red one and four of the white; then pays flying visits to one or two of the yellow, and goes off to the numerous red.

Bee No. 2 visits all five of the white, two of the yellow, goes back to the white and revisits four of them; finally it goes to the red.

I have since frequently observed the bees on the same tri-coloured bed, and have seen them pass from colour to colour in every order possible on the theory of permutations. No bee that I have observed for any length of time on these particular flowers kept to one colour.

Mr. Tansley asks, "Why bees so greatly prefer honey on blue paper, if not because they prefer the colour blue in flowers?" I think, on the whole, I shall leave Sir John Lubbock to explain the results of his own experiments.

But, whatever the interpretation may be, they do not prove that bees visit blue and red flowers more frequently than others, and this is the point. If the experiments are inconsistent with observed facts, so much the worse for the experiments—or the facts.

The statements of Messrs. Grant Allen and Hermann Müller as to the colours, etc., of the most advanced flowers, touch upon a subject about which it is hardly possible to be otherwise than dogmatic. As Mr. Darwin says, "It is hardly possible to define clearly what is meant by the organism being higher or lower." I will not, therefore, enter into any discussion as to what the characteristics of the most advanced flowers are; I will simply bring forward a few examples from our native plants, which seem to me to show, that the statements referred to are weighted with too many and important exceptions to rise to the dignity of rules.

Take the orchids, which Mr. Grant Allen declares to be "by far the highest of the trinary flowers, if not indeed of the entire vegetable world."

Among these we find some sixteen described as green, greenish-white or yellow; thirteen as purple; four as brown; two as brown and purple. Not a single well-marked blue occurs among them. In the order Boraginaceæ, on the other hand, which possesses the lowly mark of symmetry in its flowers, we have a great preponderance of blue. Among the trinary tribe we have the intensely blue *Scilla bifolia*, and the wild hyacinth, both simple as to the form of their flowers.

The veronicas are perhaps the simplest of the Scrophulariaceæ, and they are blue. The iris is a complex flower, and our commonest species is yellow.

The common flax is a simple flower, and yet blue: the campanulas are blue, and yet comparatively simple. As a last example, take the Compositæ. The highest of the three divisions into which it is usually divided is considered by Mr. Grant Allen to be that in which the corollas are all ligulate. These are, dandelion, hawkweeds, etc.—nearly all yellow: the lowest division, in which the corollas are all tubular, contains many purple flowers.

But I am not at all satisfied that Müller intends, in the words quoted by Mr. Tansley, to assert that the most advanced flowers are usually red, violet or blue. He says we find these colours "appearing for the first time in flowers whose honey is quite concealed"; but there is nothing to indicate that he considers these the most advanced. Now, as a matter of fact, there are some simple flowers—winter aconite and Christmas rose, for example—in which the honey is quite concealed.

Further, it is to be noted, that the second part of Müller's statement is to the effect, that blue appears likewise in simple flowers (*Hepatica*, *Verbascum*). The accordance with Mr. Grant Allen's views is only apparent if we accept concealment of honey as the mark of advance, and omit this second part.

And supposing we allow to the combined statements of Grant Allen and Hermann Müller the full force which Mr. Tansley seems inclined to assign to them, they do not in themselves affect the argument. If all highly advanced flowers could be shown to be blue, there would not even be a theoretical possibility that they could have been evolved by the selective action of bees, unless it could also be shown that bees have—or once had—a sufficiently strong preference for blue to cause them to pick out blue flowers for their visits.

Müller's statement, that bees "are not confined by hereditary instincts to certain flowers, but fly about seeking their food on whatever flowers they can find it," fully confirms my own observations and conclusions: it completely annihilates the whole Darwinian theory of the development of flowers by the selective agency of insects. It follows as a necessary and logical consequence from it that, however the form and colour of flowers have been produced, it has not been by the selective action of bees. The theory absolutely requires that the insects should select certain peculiarities of form and colour, and confer upon them the benefit of cross-fertilisation, so that the flowers so chosen may live down the ancestral form, and the less improved varieties; and the selection must be continuously carried out for very many generations of bees before any appreciable advance can take place in the flower.

Further, the instructive preference must be hereditary; for what could a single generation of bees do? The life-time of a bee is short—in many cases only a single season—it has scarcely time even to get educated in the matter of colour, much less to effect any alteration in the race of flowers. In fact, if the preference were not hereditary the tastes of the bee would vary from generation to generation, and one would undo the work of the other.

I think Hermann Müller's conclusions on this point would have been more in place as an appendage to my own paper, than in a professed criticism of the same.

And it is strange after such a statement, and the previous admissions that coloured flowers are not developed, but only "stereotyped and perpetuated" by insect selection, and that the bee's taste is simply a matter of education, to read Mr. Tansley's words:

"I think, in fact, we may safely conclude that . . . . red and blue, appearing as they do in flowers highly developed in other respects, were evolved through the selective action of long-tongued insects such as bees and diurnal Lepidoptera."

I cannot make out from what premises this remarkable conclusion is drawn: it remains an inscrutable mystery how the facts and arguments of the paper itself are supposed to oppose my views.

I am glad to find that Mr. Tansley agrees with me in thinking that the red hawthorn ought, according to the bee-selection theory, to attract bees more than the white one. As far as I can make out, it does not, and therefore goes against the theory.

The word "probably" used in my former paper, I admit makes the argument from the red hawthorn a poor one: if it can be shown that bees visit it more frequently than the white, the particular argument fails altogether: as far as I know, this has not been done.

With regard to the concluding paragraph of Mr. Tansley's criticism, it is doubtless unwise to argue from the existence in flowers of certain colours which cannot have been influenced in their development by insect selection, that the colours of flowers in general cannot have been so developed: it is, however, a legitimate and necessary conclusion, that they may have been developed without the selective action.

Carefully considered in connection with the general principles of natural selection, I think a very strong argument can be deduced from the facts in question.

These facts are, that many white umbelliferous flowers are pink before opening, and that other flowers—hawthorn, Christmas rose, white evening primrose—are so when beginning to fade.

Suppose for a moment that chance variations such as these occur in certain races of white flowers, when as yet red and blue are not. What advantage will the flowers obtain in the struggle for existence? Suppose that bees are attracted by the red, and prefer it to the white. In the former case, they visit flowers not sufficiently advanced to receive any benefit in the form of cross-fertilisation, and in the latter, those which are too advanced for it—which are already fertilised, and probably rifled of their honey, altogether or in part. The reddish flowers obtain no advantage from their colour: the bee obtains no honey from the unopened flower, and very little—if any—from the faded one.

I am assuming here—I know not with what authority, but the reddish tints in question do seem akin to the bluish shade which began to appear in Mr. Grant Allen's developing monk's-hood—that such colours in white flowers are the chance variations out of which red flowers are supposed to have been evolved by selection. As I have shown, neither bee nor flower obtains any benefit, and no development of colour can be supposed to take place.

This is a strong argument, but it becomes stronger when taken in connection with the educational theory brought forward by Mr. Tansley.

The bee, according to this theory, has been educated by experience to go to red flowers: it is not attracted by red as a colour. Why, then, should it pick out pink buds, and fading flowers, yielding no honey, or very little? And if it did, consider the educational effect. Will not the bee learn to distrust, and avoid red flowers?

But as I understand Mr. Tansley, he does not believe that the bee carefully selected those flowers showing a slight tendency to redness, and by accumulating such variations evolved the fully-coloured blossom: he rather seems to insinuate, that the flower may have been as perfectly coloured as the red leaf before the bee's action came into play—the bee "stereotyped" the flower, but not the leaf.

It is to be remarked that this theory, equally with that of development, requires a fixed taste, and a constant exercise of the same, on the part of the bee: it must be carefully examined in connection with the colours of the flowers receiving the greatest number of bee-visits.

NOTES ON FLYING-FISH.

By Surgeon G. D. Trevor-Roper, R.N.

TRAVELLERS along the paths of Nature ever find fresh food for wonderment, combined with a feverish anxiety to know the why and wherefore. Whether it be the history of the past, the levelling of mountains, and the upheaval of continents, with all their accompanying phenomena, or the study of things existing both animate and inanimate, they all give ample scope for reflection, thought, speculation, and the building up of golden theories too often to be dashed to the ground by a few moments' sober thought. All of us have heard of, and perhaps

marvelled at, the active little Periophthalmos, the extraordinary Ornithorhynchus, and leaf-like Phyllium, but we look with less astonishment at the strange fact, that Nature has created a fish that flies.

It is an old tale of the sailor-mother who, on being told of the existence of flying-fish, remarked, "Ah! Jack, I've heard tell of mountains of sugar, and rivers of rum, but fish that fly, Jack, na! na!" But since this good lady expressed her incredulity, the world has been made smaller; fast ships traverse the seas in all directions, and have made lands, that were once almost inaccessible, become the scene of a holiday trip, and the flying-fish an object of daily occurrence. Yet, as Professor Moseley tells us in his "Notes of a Naturalist on board the 'Challenger,'" the question of their method of flight is by no means settled. This is not so much to be wondered at, as their flight is so rapid that it is most difficult and often impossible for the eye to follow it.

We have the two genera of flying-fish: the Exocœtus, or true flying-fish allied to the gar, and the Dactylopterus or flying gurnards. It is the former of these about which I wish to speak, having had considerable chances of observing them. I have now a wing, in my possession, of one captured off the coast of Brazil, measuring ten inches in length. On that coast, as well as in the West Indies, they run to a considerable size. Those in the Indian Ocean, however, are very much smaller, few of them exceeding eight inches from snout to tail.

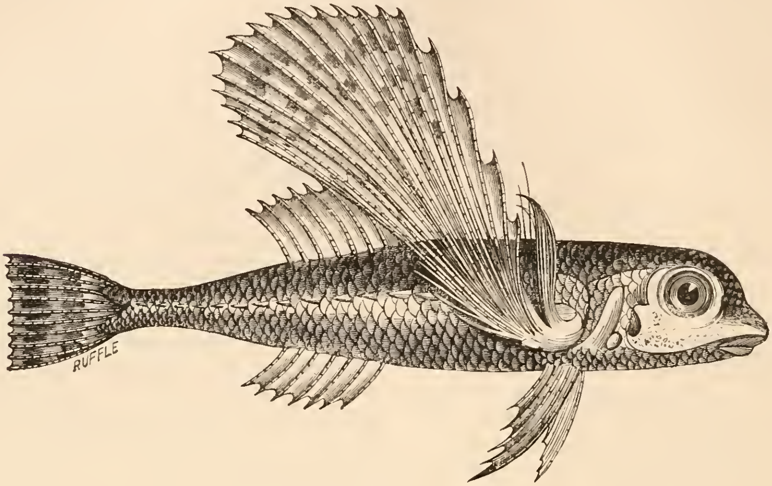

Fig. 89.—*Dactylopterus volitans.*

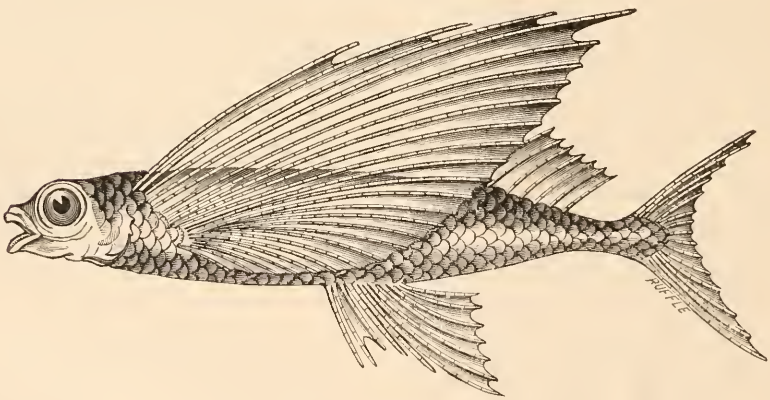

Fig. 90.—Common Flying-fish (*Exocœtus volitans*).

All day long, these little "skip jacks," as the sailors call them, are being "put up" by the ship, and flitting away on every side. But very frequently, also, large shoals are seen flying a considerable distance in frantic endeavour to escape from their enemies whose name is legion. Like moths and many bipeds they are attracted by a bright and dazzling light, and wake from their dream often to find themselves on the hard, dry deck, to be transferred to the sailors' mess; a welcome change from

salt provisions, and, indeed, most excellent eating, for those who do not mind bone.

It is rare not to find a few on the decks in early morning, that have come in over the gangway, a height of seven feet above the water-line. They often fly higher than this, as many a fair traveller in a mail steamer can tell who has been startled at dead of night by the flopping of a flying-fish through a port into the sanctity of her state-cabin.

As regards the much debated question of their flight. After carefully observing them for some time, I have come to the conclusion, that their great pectorals are never by any chance used to strike the air with. I have come to this conclusion, not only from watching them from various points of view, but also from dissection, and their so-called flight is nothing but a series of prodigious leaps. Let us look for a moment at the movements and structure of these wing-like fins. At rest they are closed, the flat surfaces looking inwards and outwards, and their direction backwards and slightly upwards.

As the wing is brought forward the rays are spread out, and the internal and external surfaces become superior and inferior, the first and longest ray foremost. The wing is continued forward in this position to a little beyond the right angle, when it is turned, in order to strike the water either directly backwards, or backwards and upwards. The extremity of the fully extended wing is also bent backwards, giving it the appearance of a scoop, and thus we see what an immense power there is for grasping the water and throwing it backwards. On leaping simply to get clear of the ship they make one or two vigorous strokes, and with their wings in the position of rest, pass through the air for a few yards and then fall. It may also be noticed that they strike the water as they enter it. When being pursued, however, they can cover a distance of over one hundred yards of space. This, with nothing to help them but the original stroke or strokes, would be impossible. In these long flights it can be seen, and I have found, standing with my eye as nearly on a level with the water as possible the best, watching them as they go away from me, that their wings are spread out to their full extent, with of course their flat surfaces superior and inferior, and there is no doubt that in this position they act after the manner of a parachute. But often this cannot be of much service to them, as they frequently go dead "in the wind's eye." I believe that there are two ways by which they progress: one, by giving a vigorous stroke with their wings—hitting the water precisely as they do in swimming—on coming to the summit of a wave; by this they are again raised into the air and propelled forwards. The other way is by a stroke of their tails, by which they not only propel themselves forward, but also are enabled to change their course.

This latter method is very similar to the movements of their relation the gar-fish. The latter I had a good opportunity of observing the other day when lying at anchor in Aden harbour. An immense shoal of small fish (species?) were disporting themselves round our stern, and at a short distance from them, several gar-fish were swimming slowly to and fro, waiting an opportunity to seize their prey. At first it was a matter of wonder that they did not at once make a dash for a fish, but it soon became evident that the little ones when prepared, were too fast for them. On the outside of the shoal, were numerous fish of the same species, but of a very much larger size, giving one the idea of forming a body-guard; this idea was soon dispelled, by seeing that the gars treated them with the greatest indifference, as they in turn were treated—the reason no doubt being that the garfish, unlike some young friends that I have met, have eyes in proportion to their stomachs, and find that the bigger fish would prove a serious difficulty if an attempt were made to swallow them. The lucky gar who had seized a toothsome morsel, often became an object of envy and hatred to his brother fish, who pursued him with sinister designs. It is then that the pursued, raising the anterior two-thirds of his body out of water, dashes along at terrific speed for many yards, creating great disturbance in the water, and as he is never followed far whilst performing this feat, it is probable that the splashing of the water renders him invisible to, or confuses his pursuer.

To return again to the flying-fish; we find that the wing is not capable of the movements necessary to propel the fish through the air. It is true it is capable of being moved up and down, though not above the horizontal, and of course, if the wings were used in this way, and had sufficient strength, which I doubt, it would cause the fish to rise in the air; but it is apparent to the most cursory observer that they never do this. As for progression forwards, I have before stated that the wing cannot be abducted beyond a right angle, and the only movements that can be brought about are striking directly backwards, or backwards and upwards.

There is at once a striking difference in formation between this great fin and the wing of a bird. The latter has anteriorly and laterally the strong bones of the wing itself and the long primary feathers, which are first brought forward to cleave the air, and the power of flight is almost solely due to this, for the same action in the fish the fin would have to be rotated forwards 45°; a feat impossible alike from the structure of the joint, and the action of the muscles covering it. It is worthy of notice that these fish have an oval swim-bladder capable of enormous distension, nearly filling the abdominal cavity at the expense of the other organs.

These are the ideas that I have formed concerning the locomotion of the Exocœti, but to speak with absolute certainty of a subject so difficult of exact observation would be most rash, and as for many

months I shall still be in the regions where they abound, I may find cause to alter my ideas; at any rate, no opportunity will be lost of carefully watching these little models of the outcome of the great "struggle for existence" and "survival of the fittest."

THE SUNFLOWER.

I HAVE been much interested in reading Mr. Lett's paper on the above plant in SCIENCE-GOSSIP for September, and I am glad that the mention of Helianthus in my article on "The Power of Movement in Plants," induced him to try some experiments.

I wish to say a word in reply to his generous criticism.

My paper was written in 1884, as a contribution to a series read before the Highbury Microscopical Society, and I made the statement quoted by Mr. Lett without carefully searching for modern investigations on the subject. This I the more readily did, because I had noticed on several occasions that the flower-heads in a bed of Helianthus did vary their position from east to south-east during the day. In 1886, I sent my paper precisely as it stood to the "Journal of Microscopy and Natural Science," in response to a request from Mr. Allen for some contribution.

In 1887 I carefully revised the entire paper after reading it before the Croydon Microscopical Club; and in doing so, I took occasion to quote from Professor S. H. Vine's "Physiology of Plants" the following statement as a corollary to my former one: "The flowers, or more correctly the inflorescences of the sunflower, even when the plant is growing quite in the open, direct their superior surfaces, not upwards, but to some quarter of the compass, usually to the south-east. This peculiarity cannot, as yet, be fully accounted for, though it doubtless depends upon some special form of heliotropic irritability. Some radical organs do not, however, assume a fixed light-position, but follow the daily course of the sun to a greater or less extent. It is usually accepted as a fact that this is the case in the sunflower, but Wiesner has found that it is not so. Under normal conditions, the inflorescences of the sunflower assume a fixed light-position, as described above; it is only when the peduncles are partly etiolated that any daily movement can be detected."

This would seem to show that there is a certain amount of truth in the popular supposition in respect of Helianthus, but that when any revolution does occur, it is a result of the abnormal condition of etiolation. This may have been the case on the occasions named by me, especially as this was noted late in summer. The experiments performed by Mr. Lett may have been made on perfectly fresh, healthy, robust plants, in which no trace of etiolation could be found.

I find, however, in Sachs's "Lectures on the Physiology of Plants," published in 1887, the following sentence on p. 692:—"In very sensitive plants, *e.g.*, young flax-stems and flower-shoots of the sunflower, it is possible to notice how its apical parts follow the course of the sun from morn to eve, always inclining towards it."

I quote this from the English edition, translated by Professor Marshall Ward, so that it seems that the notion has not wholly "passed away from the minds of modern botanists as a poet's fancy," as Mr. Lett suggests.

If it be true that the "flower-shoots" of Helianthus behave thus, why not the entire inflorescences at a later date?

The whole question is one of intense interest, and I am glad that Mr. Lett has turned his attention to it. Whatever may be the final result, I shall thankfully welcome any suggestions or experiments in relation to the subject, either in the case of Helianthus, or in that of any other plant.

H. W. S. WORSLEY-BENISON.

Sutton.

ASTRONOMY AND METEOROLOGY.

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

I HAVE a prospectus and sample of a new series of charts of the constellations, by Mr. Arthur Cottam, F.R.A.S. The sample chart represents Cassiopeia, in the scale of one-third of an inch to a degree. This is larger than any star-chart recently published. The scale is nearly that of a globe ten feet in diameter. So small a portion of the heavens is given on each chart, that the amount of distortion due to their being on a flat surface is almost inappreciable. There are thirty-six charts, and all stars are shown that are visible to the naked eye, that is, down to $6\frac{1}{2}$ magnitude.

Mercury will be at the least distance from the sun on November 6th.

There will be no occultation in November of any star above magnitude 5.

In November Mercury will be a morning star in Libra.

Venus will be an evening star, and will be close to Jupiter on the 1st of the month.

Mars will be an evening star.

Jupiter will be too near to the sun for observation.

Saturn will be nearly stationary in Leo throughout the month.

Meteorology.—The meteorological records have unfortunately again been painfully interesting. We hear of heavy snow lying on uncut corn.

At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 22nd

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in November.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
Mercury ☿	4	6 15M	11 15M	4 15A
	11	5 28M	10 39M	3 50A
	18	5 27M	10 31M	3 35A
	25	5 53M	10 38M	3 23A
Venus ♀	4	9 54M	1 47A	5 40A
	11	10 12M	1 57A	5 42A
	18	10 26M	2 7A	5 48A
	25	10 36M	2 18A	6 0A
Mars ♂	4	11 59M	3 43A	7 27A
	11	11 50M	3 38A	7 26A
	18	11 41M	3 34A	7 27A
	25	11 30M	3 29A	7 28A
Jupiter ♃	4	9 30M	1 36A	5 42A
	11	9 10M	1 15A	5 20A
	18	8 50M	0 54A	4 58A
	25	8 31M	0 33A	4 35A
Saturn ♄	4	11 3A	6 34M	2 1A
	11	10 37A	6 8M	1 35A
	18	10 10A	5 41M	1 8A
	25	9 43A	5 14M	0 41A

September, was 29·95 in. at the beginning of the week, and the highest was 50·12 in. on Wednesday morning. The mean temperature of the air was 57·2 deg., and 0·4 deg. above the average. The general direction of the wind was N.E. No rain was measured during the week. The duration of registered bright sunshine in the week was 32·6 hours, against 49·0 hours at Glynde Place, Lewes.

For the week ending 29th September, the highest reading of the barometer was 30·09 in. on Wednesday evening, and the lowest was 29·39 in. at the end of the week. The mean temperature of the air was 55·8 deg. and 0·2 deg. above the average. The general direction of the wind was N.E. Rain fell on four days of the week to the aggregate amount of 0·51 of an inch. The duration of registered bright sunshine in the week was 12·7 hours, against 21·2 hours at Glynde Place, Lewes.

For the week ending 6th October, the lowest reading of the barometer was 29·09 in. on Tuesday afternoon, and the highest 29·83 in. at the end of the week. The mean temperature of the air was 42·7 deg., and no less than 11·3 deg. below the average. The direction of the wind was variable. Rain fell on two days of the week to the aggregate amount of 0·11 of an inch. The duration of registered bright sunshine in the week was 33·0 hours, against 39·1 hours at Glynde Place, Lewes.

For the week ending 13th October, the highest reading of the barometer was 30·04 in. on Monday morning, and the lowest 29·70 in. on Saturday morning. The mean temperature of the air was 45 deg., and 7·2 deg. below the average. The direction of the wind was variable. Rain fell on Friday to the amount of 0·02 of an inch. The duration of registered bright sunshine in the week was 24·6 hours, against 34·8 hours at Glynde Place, Lewes.

The isotherms or lines of equal temperature for November over the greater part of England are of the form of the letter U. From considerations of space I will give the names of only three places for each isotherm, corresponding to the top, the bottom, and the top again of each U.

The isotherm of 41° then runs through Lanark, trends down as far as the river Tyne, and then runs up again to Haddington; 42°, runs through Ayr down to Nottingham, and up to Berwick; 43°, runs from Kircudbright down to London, and up to Flamborough Head; 44°, from the Isle of Man down to Winchester, and up to Margate; 45°, Carmarthen, through Portsmouth and Beachy Head. The isotherms of 46°, 47°, and 48° run through the west of South Wales, and across Cornwall.

The average rainfall for November is two inches for the greater part of England: along the south coast for about twenty to thirty miles inland it is three inches, on the west coast it is four inches, and in some parts of North Wales and Cornwall it averages five inches; the last figure represents nearly five hundred and twenty tons of water to each acre.

CLOUDS ON LAND AND SEA.*

NO doubt cloud observations, with a view to forecasting the weather, have been taken since the earliest times, but of late years the method of making the observations has been systematised. Mr. Abercromby and Professor Hildebrandson, of Upsala, have agreed upon a nomenclature for the various kinds of clouds, and Mr. Abercromby now comes forward to give us in this little book a description of the different kinds of cloud, and the method of determining the direction in which a cloud is moving.

The system advocated by the author is that all clouds may be sufficiently described by ten terms, these terms denoting not only the name of the cloud, but the height at which it is formed. Then these various terms are given and fully described by the aid of diagrams. Next he gives a chapter—the direction in which cloud stripes lie—explaining the perspective of clouds, and, to conclude, a most important chapter on the direction of cloud motion.

As well as the diagrams, the book is illustrated by ten exquisite photographs of the various types of clouds taken by the author.

Cloud observations will enable a practised observer to forecast the weather with some accuracy without

* "Instructions for Observing Clouds on Land and Sea," with photographs and engravings, by the Hon. Ralph Abercromby, F.R.M.S. E. Stanford, Charing Cross, London, S.W.

the cost of instruments, and so may prove invaluable when the instruments are out of reach. I have for years tried to help friends with information on the subject, but for want of pictures of the clouds my instructions have been misunderstood or forgotten.

This little book was greatly wanted, and will be warmly welcomed by all who are interested in cloud-lore.

JOHN BROWNING.

THE OPTICAL EFFECT OF "FOCUSSING UP OR DOWN" TOO MUCH IN THE MICROSCOPE.

By W. M. MASKELL, F.R.M.S.

THE annexed sketches represent the optical effects produced in some cases by bringing the objective of a microscope either a little too near to, or a little too far from, an object to be properly "in focus." The object represented is a freshwater Alga (*Gonium pectorale*) common in most pools, probably all over the world. The specimen represented was observed in New Zealand. The figure *a* shows the Alga as it appears under a Beck's $\frac{1}{4}$-inch object with "Kelver" eye-piece, in proper focus. Gonium when alive travels somewhat rapidly through the water, but a very small drop of alcohol on the slide will bring it to rest, when its component cells and their flagella can be observed. It then exhibits an arrangement of sixteen more or less orbicular cells in a square colony: their colour is bright green, with a translucent envelope round each one. The diameter of the whole plant and of its cells varies, but may average about $\frac{1}{300}$-inch for the whole plant, and $\frac{1}{2500}$-inch for a cell. If now the objective be lowered a very little, so as to throw the Alga out of focus and to see, as it were, beyond its surface, as shown in the figure *b*, not only do the outlines become blurred and indistinct, but a somewhat curious change of colour is noticeable. The whole plant assumes a green ground-colour, the spaces formerly visible between the cells being obliterated, and at the same time an elegant geometrical pattern is produced, with various tints. Four crimson specks appear at about the middles of the four inner cells, and with these as centres four delicate circles of bright yellow interlace each other, the radius of each circle being the distance between two crimson spots. The spots are also connected by narrow bands of lighter red colour. The outer ring of cells appears as composed of pyriform bodies, the points inwards and overlapping, producing thus the semblance of green spokes in the four circles. In each of these cells, on the circumference of the circles, is a crimson spot formed of concentric curves open towards the middle of the plant. By focussing downwards a little more or less the crimson spots or the golden circles may be made more or less conspicuous on the green ground. If again, the object glass be screwed *up*, past the true focus, as shown in the figure *c*, an entirely different effect is produced. Instead of the whole plant appearing solid, as in *b*, the spaces between the cells are amplified, and the whole colony seems larger and more scattered; and the cells, quite disconnected, are now not green, but yellowish-brown with a broad darker band encircling each.

These effects of colour are noticeable not only with $\frac{1}{4}$-inch objective, but also with the $\frac{1}{8}$: and they may even be made out with the 1-inch, though, of course, not well, as the plant then appears so small. I have carefully examined a good many (perhaps fifty) specimens of gonium to observe the changes mentioned, and have found the same in all, provided the plants were not mutilated. In cases where two or three cells were missing the colour-changes were not easily observed.

Of course, I presume that the effects here spoken

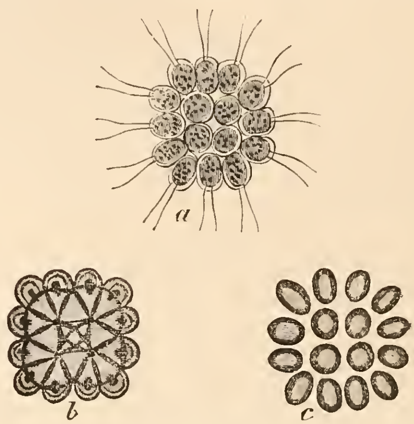

Fig. 91.—*Gonium pectorale* (Mueller); *a*, its true focus; *b*, object-glass lowered too much; *c*, object-glass raised too much.

of are easily explicable: the passage of the light through the semi-transparent green cells, the translucent envelopes and the empty spaces, producing complementary colours. And in itself the thing is doubtless not of any importance. Yet indirectly it may possess some value as in a certain kind of way a warning. From the measurements which I have been able to make I imagine (my fine adjustment not being graduated there is no attempt at complete accuracy) that the distance through which the $\frac{1}{4}$-inch objective passes from *a* to *b* is not more than the $\frac{1}{150}$ of an inch: and from *a* to *c* about the same, or rather less. This is accomplished by a very slight turn indeed of the milled head of the fine adjustment. In the case of *Gonium pectorale* it is usually pretty clear when one has the plant properly in focus, especially as the view of the flagella comes as a guide. But there are many objects as to which it may be supposed that so small a difference as $\frac{1}{150}$-inch may not seem to throw them out of focus whilst in reality they are so to an extent which might cause error. Query: might the striæ

of Diatoms come under such a category? It is a common thing to hear and read that the appearances of things under the microscope are not always to be taken as strictly true: and doubtless the microscopists of old days owed some of the queer figures they drew to this cause. The changing colours and form of *Gonium pectorale* as above noticed may perhaps serve a useful purpose, if they warn some young microscopists to be very particular in the observations they make; possibly also some older hands might take a hint.

Wellington, New Zealand.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

Human Polarity.—Some years ago a large number of people educated themselves into the belief that they could sleep better with head to north and feet to south, than if lying east and west. This was between 1845 and 1860. It appears that this notion has either revived in America, or has not yet died there. A doctor writing in the "St. Louis Globe Democrat," asserts that the notion has its foundation in true scientific facts, and that each human system has its magnetic poles, one positive and one negative, some persons having their positive pole in the head and their negative in their feet, and *vice versâ*. He proceeds to tell us hat, in order that the person sleeping shall be in perfect harmony with the magnetic phenomena of the earth, the head, if it possesses the positive pole, should lie to the south, or if the feet possess the positive pole the head should lie to the north.

This doctor, like those with whom I discussed the subject at the time above-named, seems to be acquainted only with the declination of the magnetic needle, and to know nothing of the dip. If the positive-footed people are to lie in the magnetic meridian, they must, in our British latitudes, lie with heads 18 degrees W. of North, and with heels upwards at an inclination of 67 degrees from the horizontal line, or within 23 degrees of the perpendicular.

In 1720 the dip amounted to 74° 42′, or within 15½° of the perpendicular, in London. To retain either of these positions, the victim of "perfect harmony with the magnetic phenomena of the earth" would require to be securely tied by the heels, and all the bedding to be tied likewise, to prevent the tobogganing that would otherwise occur at such angles. At two regions of the earth, viz., at the north and south magnetic poles, the victim of magnetic harmony would require to sleep in perpendicular position, head or feet downwards, according to which pole, and the positive and negative specialities of the individual.

The statement of the learned doctor, who tells us that the positive pole of the person draws one way, but the magnetic pole of the earth draws the other way, and forces the blood towards the feet, affects the iron in the system, tones up the nerves, and makes sleep refreshing and invigorating, indicates the necessity of placing the body accurately in order to obtain the full effect. In our latitude the magnetic force, which determines the dip, exceeds that which effects the declination, or, otherwise stated, the down-pull stronger than the north pull.

Steering Balloons.—Four months ago several newspapers and magazines informed us that Mr. Peter C. Campbell, of No. 455, Fifth Avenue, Brooklyn, had invented and constructed a "novelty air-ship," a long egg-shaped gas-bag with clock-work to move a fan-wheel at one end, and a horizontal screw below to raise or lower the ship. Besides these there were broad flat wings, extending on each side, to guide the balloon by being raised or lowered at any desired angle, and two flat V-shaped screens spread like the tail of a bird attached to the rear, and just forward of the propeller. These to maintain the perpendicular and to steady the whole. All these appliances are attached to a light frame, which tapers to a point forward. A small electric engine is to actuate the clock-work. We are told that a model three feet long sailed about a room successfully.

This sailing of the model may appear satisfactory, but I fear that such experiments on such models with clock-work are necessarily fallacious, for two principal reasons. The first is that in a room the air is still, and a small progress—say of five or six miles per hour, makes a great show, while in the open air such a pace would be insufficient to overcome a very moderate breeze. The mean velocity of the wind in our climate is from twelve to fourteen miles per hour at the surface, or nearer to twenty-nine at an elevation of 1000 feet. With such a breeze, such a machine could do no more than effect a slight deviation from its drift with the wind.

The second fallacy in ordinary models, is that they do not carry the motive-power machinery. Clock-work of course has no such power, it merely receives and transmits it. The clock-work of the model is supplied by winding before the model is started. In practice the machine that does this work must be carried, and this constitutes a serious addition to the demand for increased bulk of the gas bag.

The best prime mover yet known, is the muscular power of the aeronaut, and my old friend, Commander Cheque, who carefully studied this subject and was very sanguine, concluded that with a feather paddle, which is the best machine, about five miles an hour through the air is attainable by our ordinary balloon. It is very doubtful whether the elongated shape usually designed for these "air ships" would afford any advantage in this respect, as every deviation from the spherical figure demands greater surface

and weight of bag and netting in proportion to the quantity of gas inside; the whole bag must be proportionally large.

African Pygmies.—One of the abounding follies of the pedant is that of sneering at popular traditions. The philosopher treats them very differently by studying their origin—they must have some sort of origin. They may be fallacious, but they cannot be baseless, and their history is always instructive. In many cases they are records of fact concerning which the pedant is simply ignorant.

This was notably the case with the traditions of the fall of meteorites which were treated with such lofty contempt until the beginning of the present century, and may yet prove to be also the case with the sea-serpent.

Among such traditions is that of the existence of a race of pygmies in Central Africa, the truth of which has been finally demonstrated by Emin Pasha. The Akkas that he found in the country of the Monbuttu, one of whom he retained as a domestic servant, are true pygmies, as proved by the detailed measurements he sent to Professor Flower, and the skeletons he disinterred and forwarded to the British Museum, and which arrived safely in September 1887. They are of full-grown people, one a man, the other a woman. The height of the female is just four feet, to which should be added half an inch f6r the thickness of the skin on the soles of the feet and top of the head. The male skeleton about a quarter of an inch shorter. The height of the full-grown woman, of which Emin states particulars, is barely three feet ten inches. As Prof. Flower observes, "one very interesting and almost unexpected result of a careful examination of these skeletons is that they conform in the relative proportions of the head, trunk, and limbs, not to dwarfs, but to full-sized people of other races, and they are therefore strikingly unlike the stumpy, long-bodied, short-limbed, large-headed pygmies so graphically represented fighting with their lances against the cranes on ancient Greek vases."

Their skulls are quite unlike the Andamanese and the Bushmen. They are obviously negroes of a special type, to which Haney has given the appropriate name of Negrillo. They occupy various spots across the great African Continent, within a few degrees north and south of the equator, extending from the Atlantic Coast to near the shores of the Albert Nyanza (30 deg. E. long.), and perhaps even farther to the east, south of the Galla land; there are still surviving scattered communities of these small negroes, all much resembling each other in size, appearance, and habits, and dwelling mostly apart from their larger neighbours, by whom they are everywhere surrounded.

The above particulars are derived from a lecture delivered at the Royal Institution, by Professor Flower.

Vegetable Food.—J. Rutgers has recently made a series of experiments on the relative nutritive value of animal and vegetable proteids, *i.e.* the nitrogenous constituents or "flesh-formers," as distinguished from the food-material that merely supplies the animal heat. The experiments were made on human beings, and the conclusions are summarized as follows:—

"Vegetable proteids containing an equal amount of nitrogen can be substituted for the animal proteids, which were used without the nitrogenous balance of the body being disturbed. Beans and peas load the intestinal tract very much, both in respect of their solid constituents and of the gases formed from them; meat and rice have not this disadvantage. This and other contra-indications of a similar nature would render an exclusive vegetable diet undesirable. The acidity of the stomach and also that of the urine is much smaller when the diet is exclusively vegetable than when a mixed diet is taken."

It is now generally known that peas, beans, lentils, &c., are the most nutritious of vegetables, as regards flesh-forming, but it is not so generally known that they are far more so than flesh meat; beef without bone contains an average of 17 per cent., while the common dried peas as sold in the shops contain 24 per cent. But the nitrogenous food which they contain (casein) is more difficult to digest than that in flesh, unless it be specially treated as I have described in "The Chemistry of Cookery."

Besides this they contain much cellulose (woody fibre), which some people can digest much more readily than others can, this difference apparently depending upon the supply of saliva and the other secretions that contain animal diastase. My own experiments on myself and observations of the experience of vegetarians have convinced me, that the digestive organs may be educated considerably in this direction; that after a long habit of flesh-feeding a sudden change to a purely vegetable diet is usually attended with deficient nutrition displayed very visibly at first, but followed by a gradual improvement even though less food be afterwards taken. This I believe to be due to increased supply of saliva, pancreatic and intestinal juices which are required for converting the vegetable fibre into dextrine. The majority of vegetarians escape the trouble of this transition by using milk and eggs, and I recommend all who try the experiment to do this at first and proçeed gradually to the pure vegetable dietary.

The diminished acidity observed by Rutger supports the vegetarian contention that gout, rheumatism, and the other ailments due to excess of uric or lithic acid, are cured by abstinence from animal food. I have met with many examples of this, one very striking case but a few days since, when an old gentleman in his eighty-ninth year called upon me respecting a proposed local effort in connection with the vegetarian movement. Three months ago he was

seriously ill, expecting to die, and was induced to try the experiment of changing his customary flesh meat diet. To use his own words, he has no "vegetarian fad," but found such immense benefit from the change that he is actively working to induce others to follow his example. He rises at 6 A.M., goes to the city, does a day's work there and takes long walks for recreation. He walked nearly two miles to call upon me, and back again, without fatigue, and his appearance verifies his statements of vigour, both of mind and body.

THE BIOLOGICAL LABORATORY AT PLYMOUTH.

THE appearance of the second number of the Journal of the "Marine Biological Association of the Uuited Kingdom," which, it will be remembered, was founded in order to organise a series of stations for the pursuit of biology, affords us a pleasant and practicable pretext for reviewing the work of this association up to the present, and of giving some account of their laboratory at Plymouth formally opened on June 30th last.

The extraordinary lack of anything like a scientific knowledge of the life-histories, habits, and food stuffs of our important food fishes was amply demonstrated at the various congresses held in connection with the London Fisheries Exhibition of 1884. This bore fruit, after many days, in the formation of the association whose Journal now lies before us.

In a paper read before the Society of Arts in the year 1885, Professor E. Ray Lankester gave an authoritative statement of the aims of the proposed association, together with a short sketch of the work done by similar bodies up to that time. He drew attention to the fact that the French, Norwegians, and more especially the Americans, had made attempts to regulate their sea fisheries on rational principles, to understand and control, for the advantage of their race, the operations of nature, rather than leave them to the unknown development of physical causes. On the other hand, although our fisheries are of immense importance to us, we had made little or no endeavour to obtain an accurate scientific knowledge of the conditions most favourable to their development. Our ignorance on the subject of fish and fishing is appalling—we do not know, for instance, why soles are getting scarcer every year, nor why great shoals of fish appear at certain seasons at certain spots, or cease to so appear. We are also completely ignorant of the possibilities of artificial rearing, and stocking of the fishing grounds, or of cultivating favourite foods in order to favour the increase of the fish. To provide facilities for acquiring such knowledge the association determined to found a series of laboratories at various stations, each provided with boats and fishermen, and having within its walls tanks for hatching eggs, and watching fish, and conveniences for trained naturalists and biologists.

The first of these is now a visible entity in the form of the handsome building on Plymouth Hoe, and of which we propose to give some account.

Most of our readers know Plymouth Sound, a somewhat triangular inlet of the sea, protected from southerly gales by a magnificent breakwater which spans the mouth. Along its most inward shore, about two miles from the breakwater, stretches the town of Plymouth, a line of light grey houses cresting the cliffs. The Sound is everywhere bounded by cliffs, which on the western side are more sloping and exhibit the delightful green lanes and close set clumps of trees of Edgcumbe Park.

Between the town and the Sound is the historic cliff top, known as the Hoe, and on the eastward part of this, just below the old citadel of Charles II.'s time, is situated the laboratory. A rare place for work in the bright summer days, with the panorama of the Sound spread below, a blue sheet of water with swift shadows of cloud coursing over it, and its surface dotted with craft of all kinds from the handsome old training brigs, relics of the wooden walls of past days, to grim, modern armour-clads and stately Australian liners. The room too in which the naturalists work is always musical with the plod of the water in the tanks and redolent of the sea.

The building is of local marble, light grey in colour, and offers a long front to the sea, flanked at either end with square projecting blocks. The central portion connecting the terminal blocks, is two stories, and each story forms one long room of which the lower is the large aquarium, while the upper forms the general working room of the naturalists. Of the two terminal blocks, that to the east is entirely taken up by the residence of the director, while that to the west—the central connecting part, is given up to the work of the institution. In addition to the two long central rooms above mentioned, there is a chemical room, where the necessary reagents are stored; opposite to this is a room devoted to physiological research, in which are also large cases with glass fronts intended for the display of the reference collection. These two, together with a small room for photographic purposes, occupy the second floor; above them is the library, which already has on its shelves a fair collection of reference books and periodicals.

The large airy room which forms the work-place of the naturalists is beautifully fitted up, and pleases all with the admirable completeness of its arrangements. Down the centre run a double row of tanks, twelve in all. Each is of slate, with a plate glass front, ard is about four feet long, by three wide and two deep. Into each a couple series of jets of sea-water are continually playing with considerable force, giving complete aeration with constant renewal. The north side is divided off into six spacious cubicles, each of which

has a complete set of reagents, and is allotted to one of the naturalists; the north light is admirable for working with the microscope, and there is plenty of it since each cubicle is fronted by a large window.

The room below this also occupies the whole length of the central part of the building, and contains a number of large handsome tanks wherein forty-pound congers, huge bass, and the like may find plenty of room to disport themselves. These are at present occupied by congers, soles, bass, rays, lobsters, crabs, etc., which are expected to afford the association, in return for their keep, an abundance of eggs and larval stages. Mr. Cunningham, M.A., the resident naturalist, has special charge of these, and has contracted a most fatherly liking for his finny charges, especially the huge handsome, sleepy congers with their velvety black sides and graceful movements. His two papers in the current number of the Journal, and the short account of the segmentation of some Teleostean eggs furnished to the British Association, are an interest of the results to be obtained. Up to the present, however, the congers have not answered his expectations, since they resolutely refuse to breed; and this is the more disappointing, because the life-history of these, as well as of other eels, is a complete mystery which has tantalised naturalists for a long time past. In the base of the building are the engines and pumps which keep up the circulation of the sea-water, which is done by two large gas engines and a number of centrifugal pumps. The larger of the two engines is also in connection with an ejector placed below low-water level, which supplies sea-water wanted to make good any loss from evaporation or leakage. This fresh supply, together with the overflow from the aquaria tanks, passes into a large reservoir from which it is sent afresh through the pipes by the pumps. By having a closed circulation of this character, the density of the water can be artificially controlled, and this is the more necessary, since Plymouth Sound receives the flow of two rivers and at times of large rainfall, as for instance, this last summer, when its water fell much below the normal density.

The institution is dependent for its supply of fish and specimens generally upon hired boats, one of which goes off every day with tanks and bottles in which to bring home the catch alive. The dredge and surface-nets are employed. These boats are under the control of a practical fisherman, Mr. Roach, who is rapidly making himself invaluable to the institution. His readiness to help in every way is most marked, and the pleasantest reminiscence of a couple of months spent there is inseparably linked to his cheerful bronzed face and hearty voice. The other source from which supplies are drawn is the professional trawlers, fine vessels of thirty to sixty tons, manned by a splendid class of men, remarkable for their steady industrious habits. The strong religious feeling which is characteristic of the class is a survival of John Wesley's preaching more than a century and a-half ago. It is equally present at Brixham, another large trawler's centre, where it is one of the sights to see the men go to church in procession on a Sunday morning. The trawling boats come home every Saturday, and start on the Monday; the supply derived from them is thus intermittent, and it is rapidly becoming most necessary to have some means of following them to their fishing grounds to obtain what is necessary. Nothing but steam will enable this to be done, and the most pressing need now felt at Plymouth is the want of a small steamer, so that an opportunity is afforded to any lovers of pisciculture and practical biology to obtain one. Want of space prevents us from completing this account, but one must say a few words in grateful acknowledgement of the services already rendered by the present director, Mr. G. C. Bourne, M.A., F.L.S., and to the efficiency of the laboratory. His indefatigable zeal and sympathy communicates itself to all who may have the pleasure of being associated with him on the work.

W. B. A.

NOTES ON THE DIVISION OF THE VORTICELLA.

OBSERVED under $\frac{1}{4}$-inch objective. Eye-piece B. Spot lens. Daylight:—At 10 o'clock observed an isolated vorticella with the following appearance.

There were no cilia observable.

Fig. 92.

At 10.1 there were cilia at work at *a*.

Fig. 93.

At 10.2 a sharp contraction of stem occurred. On regaining its position, the black mass has divided in the middle. There seems to be no attempt at assimilation, the granules and monads in the vicinity being perfectly quiescent.

At 10.5 greater segmentation in the middle. The stem apparently has a tendency to divide.

Fig. 94.

At 10.11 a sharp contraction of stem, the vesicles being further divided. Lateral movements frequently occur, as if the vesicles were desirous of parting company.

Fig. 95.

At 10.15 first tendency to assume a cup-form at sides, a truncated cone appearing in the centre.

Fig. 96.

Great agitation and swaying of the protoplasm.

Fig. 97.

At 10.18 an edge of thin protoplasm is becoming more and more apparent. Will this develop cilia?

Fig. 98.

At 10.20 separation more complete. The vesicles are longer and thinner.

Fig. 99.

Large tentacles (? hydrazoid processes) tend to appear at the sides.

At 10.22 cilia now developed from the belt spoken of above.

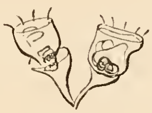

Fig. 100.

They move very slowly, and are evidently not yet perfect in functional activity.

At 10.25 the undulatory motion continues. On criticism of the $\frac{1}{8}$ the cilia are more like columnar epithelium.

There is no tendency to assimilation at present. Will this come with the completion of the cilia?

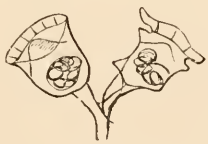

Fig. 101.

At 10.27 a curious occurrence in *b* vorticella. A ridge of cilia (?) appears at *a*.

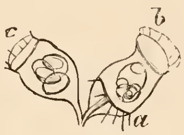

Fig. 102.

At 10.29 sharp contraction. Considerable latent period before relaxation. Ciliary wave more rapid.

10.30 cilia evidently separating.

10.31 another contraction. Cilia on *c* completely developed, yet no assimilation. *b* is now in a position unfavourable for observation.

10.35 first assimilation by *c*—a small monad.

10.45 the lower belt of cilia on *b* at *a* appear very active. Do they assist in the final division of the stalk, and why do they not appear in *c*?

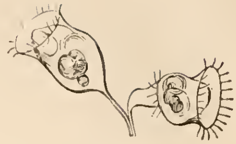

Fig. 103.

Whilst the left-hand vorticella (*c*) is stationary, *b* is continually swaying backwards and forwards.

At 11.5 division complete as far as cells go. The stalk is at present common property.

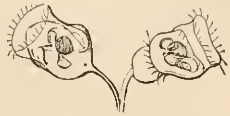

Fig. 104.

At 11.35 the stem was completely separate and then left microscope.

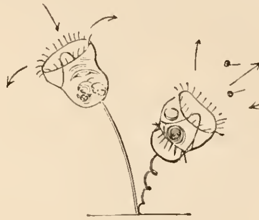

Fig. 105.

The difference in the size of the sketches is owing to the fact that sometimes I used the one-eighth as well as the one-fourth.

J. HERBERT FREDERICK.

Sidcup.

THE EYES OF THE STOMATOPODA.

By Professor J. WOOD-MASON.

(*Superintendent of the Indian Museum.*)

THE following important and highly interesting paper, was recently read before the Microscopical Society of Calcutta:

The eyes are more or less distinctly bilobed in all the Stomatopoda. Of the two lobes into which the eyes are divided, the one is, in relation to the long axis of the animal's body, inner in position, and directed inwards, upwards, and forwards, and the other is outer, and directed outwards, downwards, and backwards in various degrees in the different genera and species of the order; so that, if the planes dividing the two lobes from one another are produced downwards, they will meet at a greater or less distance, forming a narrower or wider angle below the long axes of the eyes. While investigating the relations of the interlobar planes of the eyes to the arteroposterior vertical plane of the animal's body and to one another, and studying the form of the eyes generally, in the different genera and species of the group, for taxonomic purposes in connection with my descriptive catalogue of the collection of Malacostracous Crustacea in the Indian Museum at Calcutta, I have come upon some

interesting features in the structure of the eyes, and particularly of their lenses, which appear to have hitherto escaped the notice of anatomists, and to which no reference is made in the latest considerable contribution to our knowledge of this interesting order of Crustacea.

The eye of *Squilla raphidea*, the largest species of its genus, is composed of two huge cylindrical lobes of nearly equal size. The inner and shorter of these is directed inwards, upwards, and forwards, while the outer and longer takes an exactly opposite direction, and looks outwards, downwards, and backwards. When the eye is viewed as a whole in profile, its two lobes are seen to be separated from one another by a wide and shallow obtuse-angled groove, which if continued backwards on to the upper surface of the peduncle would bisect the obtuse-angled distal extremity of the peduncle, which is shaped like the two-way piece from which the bronchi fork in a windpipe. As in most arthropods in which the lens is divided into facets, the lens-facets of the stomatopod eye are hexagonal. When a strip of the lens of *Squilla raphidea* including portions of each lobe and of the dividing groove is viewed under the microscope, two rows of lens-facets in the bottom of the groove are seen to be elongated in a direction at right angles to the groove, or to the plane dividing the two eye-lobes from one another. The lens-facets are, in fact, modified at the junction of the two eye-lobes.

The genus Lysiosquilla has eyes much like those of the above-named member of the genus Squilla, with the eye-lobes produced on each side of the interlobar plane and divided from one another by a shallow groove. In *L. maculata*, giant of its genus, the ordinary hexagonal lens-facets of the two eye-lobes are divided from one another by a band of six longitudinal rows of smaller and differently-shaped facets arranged in oblique series of six. Some of these facets are hexagonal, others are rhomboidal, and a few are irregular in shape; they are all, however, obvious modifications of the hexagon.

In the genus Pseudosquilla, the lobes of the eyes are scarcely at all produced, and the lens is not perceptibly divided into lobes. A band of different coloration from that of the surface on each side of it can, however, be made out by the unaided eye crossing the lens from the distal edge of the non-faceted peduncle above to the corresponding point below. Under the microscope, this band is resolved into six longitudinal rows of square and transversely oblong lens hexagons arranged in almost perfect cross series of six.

The eye of *Gonodactylus chiragra* is sub-cylindrical; the lens occupies, roughly speaking, the outer apex of the peduncle, as in many Decapod Crustacea, and, there is no appearance of division into lobes. Nevertheless, a band similar to that met with in Pseudosquilla, which all zoologists admit to be closely allied to Gonodactylus, is present, and is similarly resolvable under the microscope into six longitudinal ridges each formed of lens-facets which are elongated in a direction at right angles to the band, and have almost entirely lost all traces of their former hexagonal shape. This band traverses the longer surface of the oval eye, dividing it into two equal parts, which correspond without doubt to the eye-lobes of *Squilla raphidea*. In this species of Gonodactylus, the two lobes of the lens participate equally in the formation of the one apex of the eye, the two lobes being extended equally in the one forward direction instead of in two opposite lateral directions. But in *Gonodactylus gracilis* and its allies, the two lobes are so swollen laterally inwards and outwards, that the whole eye has come to resemble a fat pea. This lateral extension of the eye-lobes, carried a few degrees further, would produce an eye of the form and proportions of that of *Squilla raphidea*.

In Protosquilla, which has recently been founded by Brooks for the reception of some species that had previously been associated with Gonodactylus, the eyes, as might be expected, differ in matters of the minutest detail only from those of *Gonodactylus chiragra*.

Of the remaining genera of Stomatopoda, Leptosquilla, Chloridella, and Coronida, the first is still very rare, and, being only represented in the collection under my charge by one very young specimen of its single species, has not been examined, but from its general structure, it may, with tolerable confidence, be inferred that in the adult condition it resembles Squilla in the form and arrangement of its lens-facets; the second, which has such small and degenerate, though, strange to say, strongly bilobed, eyes that nothing can be made out about its lens-facets, is such a very slight modification of the Squilla type that it may be safely set down as having once had eyes like those of Squilla; and of the last, which has degenerating, but nevertheless also strongly bilobed, eyes, I only possess badly preserved specimens, in which, however, I feel fairly sure that I can detect, between the lens-lobes, traces of a narrow granulated band which may represent an arrangement similar to that seen in *Lysiosquilla maculata*.

Both in longitudinal section at right angles to the lens-band and in transverse section, the soft structures of the eyes present no less distinct signs of duplicity than do their lenses, and, in *Gonodactylus chiragra* and some species of Squilla, exhibit a nearly perfect bilateral symmetry; the retinulæ and vitrellæ, especially the former, being disposed plainly in three groups, two lateral corresponding to the two lobes of the lens, and one medium corresponding to the dividing band of modified lens-facets, in size as in number; and each lateral group of retinulæ being separated from the median by an interval which is wider than the large median retinulæ are broad. Each of these intervals is in *Gonodactylus chiragra* occupied by the branches of one of two large blood-vessels which enter the eye, one on each side of the middle

line of the peduncle, and send off abundant fine capillary branchlets to all parts of the retina only, the vitreous body being non-vascular.

Whether the bilobed condition of the eyes in the Stomatopoda is to be explained by two pairs of originally sessile eyes (such as are present in the Amphipod genera Phronima and Ampellisca) having been first mounted on one pair of movable stalks (as has actually occurred in the Arachnidan family Trombidiidae) and afterwards become one pair by the almost complete coalescence of the two eyes of each side, or whether, as is perhaps the more probable, it is the result of a secondary adaptation to the particular conditions of life of these animals, is an interesting subject for future investigation which can only be attempted with profit on perfectly fresh eyes.

FUNGUS FORAYS IN FRANCE.

THE Société Botanique de France having invited English mycologists to join their meeting in Paris last season, the invitation was accepted by the Rev. Canon Duport, Mr. Phillips, of Shrewsbury, Mr. Plowright, of King's Lynn, and myself.

Accompanied by Canon Duport, I visited the Vosges mountains before the meeting, with the view of making excursions in search of the interesting fungi recorded by Monsieur Quelet, of Herimoncourt, in his "Champignons du Jura et des Vosges." But, on our arrival at Gerardmer, we found that snow had already fallen, and the next day a heavier fall took place, completely covering the ground.

A few interesting species were noticed on the first day, amongst which I may mention: *Cortinarius alboviolaceus*, *C. brunneo-fulvus*, and *C. variicolor; Hygrophorus tephroleucus* and *C. pustulatus; Russula mustelina* and *R. rubra; Mycena rosellus.*

We endeavoured, the next day, to ascend the Hoheneck, one of the highest summits of the Vosges; but, after wading through the snow for hours, were obliged to give up the attempt. Gerardmer is an excellent centre for excursions, the hotels are good and cheap, and the fare plentiful. The scenery in the neighbourhood is of a high order—fine forests surrounding a series of small but picturesque lakes, roches moutonnées and ancient moraines bearing witness to the existence of former glaciers, waterfalls, and splendid views over Rhineland as far as the Bernese Alps. There is an excellent hotel on the Schlucht, about three hundred feet below the summit of the Hoheneck. We had to leave Gerardmer with regret after spending two days there.

On our arrival in Paris, we visited the fungus exhibition held in the rooms of the society, Rue de Grenelle. Owing to the dryness of the season, there were fewer fungi of interest than might have been expected. The following were the most remarkable species in the exhibition: *Hygrophorus erubescens*, formerly confounded with *Tricholoma Russula*, but distinctly a Hygrophorus resembling a small form of *H. eburneus*, but of a pinkish colour; *H. pudorinus*, figured by Kalckbrenner, a blushing beauty from the Vosges; *Clathrus cancellatus; Polyporus Pes-capræ, P. croceus, P. leucomelas; Pleurotus mastrucatus*, and *P. nidulans; Armillaria bulbiger; Pholiota destruens; Queletia mirabilis*, a curious puffball with a long shaggy stem, growing on tar, and brought by M. Lebreton from Normandy; *Clavaria juncea; Pholiota destruens.*

We visited on the following day the Forest of Hesblay, where the only fungus amongst those gathered which seemed to me of interest was *Pholiota caperatus.*

The next day was devoted to the Bois de Carnelles; but the ground was very dry, and fungi were scarce; *Mycena aurantio-marginatus*, and *Lepiota holosericeus* were our best finds.

In the evening M. de Seynes, the President of the Société Botanique de France, entertained at a most recherché dinner the English visitors, and the French mycologists, Messieurs Boudier, Quelet, Richon, Lebreton, Planchon, Roze and Mougeot.

After dinner Canon Duport read a letter from the President of the Woolhope Club, inviting French mycologists to join the Hereford meeting next year, and Mr. Phillips expressed in English his sense of the liberality of the host and the cordial welcome given to the English visitors.

The excursion next day was arranged for Pierrefonds in the forest of Compiègne. After a short visit to the grand old castle, one of the finest feudal monuments of France, restored by the celebrated architect Viollet-le-Duc during the last empire, we explored the forest. We found it to be excellent fungus ground, but the distance from Paris limited our researches.

The following species may be mentioned as specially interesting:—*Lepiota polystictus; Mycena collariatus; Lepiota Friesii; Tricholoma lascivus; Nolanea proletaria; Clitocybe suaveolens*, and *C. odorus; Lentinus cochleatus; Cortinarius fulmineus*, and *C. Lebretoni; Marasmius prasiosmus, M. globularis*, and *M. fusco-purpureus.*

The remainder of the week was devoted to the forest of Fontainebleau. Making the Hôtel de Lyon our headquarters, we drove through the forest in carriages, halting at spots prolific in fungi.

The cold weather had played havoc with many fungi we expected to find. We noticed a large number of *Cortinarius violaceus* shrivelled by the frost; but still a good many interesting species remained, amongst which I may mention:—*Psalliota Vaillantii; Collybia longipes; Hypholoma Candolleanus; Inocybe dulcamarus; Hebeloma strophosus; Cortinarius anfractus, C. dibaphus*, and *C. rufo-olivaceus; Boletus erythropus; Clavaria coralloides; Merulius radiatus; Russula Queletii*, and *R. delica; Polyporus croceus; Pholiota adiposus; Hygrophorus olivaceo-albus.*

In conclusion a few words respecting the fungi

eaten during the excursions may be acceptable, as these forays were originally started with the view of promoting the use of fungi as an article of food. But in this respect they do not appear to gain ground in popular estimation.

The great difficulty is having them properly cooked; and as may be supposed, the French have the advantage over us in this very necessary particular. The fungi eaten at the various dinners of the society were *Boletus edulis*, *Cantharellus cibarius*, *Tricholoma nudus*, *Lactarius deliciosus*, and *Helvella crispa*. *Helvella crispa* was, in my opinion, by far the best. But, in this country, it grows too sparingly to furnish a good dish for the table. An interesting discussion took place during one of the evening meetings on poisonous fungi.

It was generally agreed that the poisonous qualities of *Agaricus muscarius* had been exaggerated, and that the majority of poisonings recorded in the newspapers were caused by *Amanita pantherinus* from its close resemblance to *Amanita rubescens*, a species much eaten by the French peasantry. *Amanita mappa* was also considered a most dangerous fungus.

I was anxious to hear the opinion of French mycologists about the merits of *Amanita Cæsarea*, described in books as the best of all fungi. But all who had eaten it did not think much of it and considered it "fade." It is, however, possible that in France, where it occurs sparingly, it does not develope its savoury qualities, it being a southern species abundant in Italy.

T. Howse, F.L.S.

10 *Cheyne Gardens*, *Chelsea Embankment*.

ROTIFERA AT STAINES.

In your August number, Mons. Rousselet records the finding of *Asplanchna myrmeleo* at Staines, and gives a capital drawing of the female. Staines is a favourite hunting-ground of mine, and as I found *A. myrmeleo* tolerably abundant the first visit I paid the place, after the publication of Mons. Rousselet's letter, it occurred to me that the male ought also, sooner or later, to be forthcoming; and I am happy to be able to record my success in finding him, and enclose a rough sketch herewith. As I did not observe him when I first looked over my last gathering from the ponds, I conclude that he was born in one of the troughs, in which I have since kept him; but although I did not actually see the birth, his appearance is so characteristic of *A. myrmeleo*, and so unlike any other asplanchna, that further proof of his specific identity seems to me unnecessary, and consequently Mons. Rousselet's statement that the male has not been seen will no longer hold good. Like the males of the other asplanchna, it is characterised by the total absence of mastax or other digestive apparatus. There is a large tripartite brain, with large eye-spot, also dorsal antennæ, a vascular system with numerous vibratile tags, and muscular system as in the female. The contractile vesicle is very large and very active, and the ovary and ovisac of the female is replaced

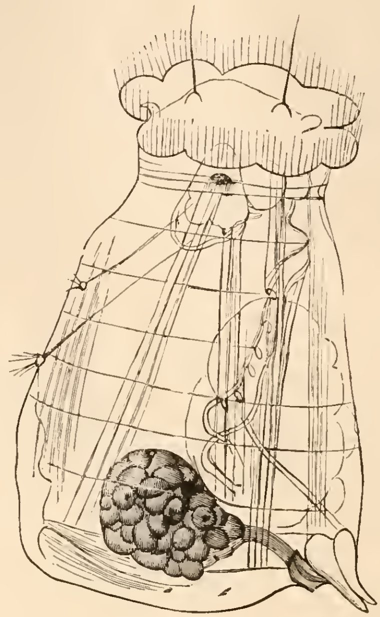

Fig. 106.—Male of *Asplanchna myrmeleo* (mag.).

by a large sperm sac or testicle with a duct which terminates in a protrusile penis behind the foot under a valve-like flap. The average size of the specimens I have seen was $\frac{1}{30}$th of an inch long; habitat, marsh ponds at Staines.

Geo. Western.

MICROSCOPY.

Australian Sponges.—In your correspondent's very interesting account of his Australian wanderings, I notice at page 218, he saw many sponges collected by the members of the Melbourne Naturalists' Club. Now I hope I am not asking too much in enquiring would C. P. put me in communication with some one at Melbourne who has collected sponges in Australia? As a microscopical student, I have taken up sponges and should very much like to obtain some specimens in spirits to section and examine here.—*Joseph Clark.*

Dissolving Gum Tragacanth.—Your correspondent, J. F. H., in September number of your paper, will find that the following will answer very well for his purpose:—Powdered gum tragacanth, and powdered gum arabic, of each $\frac{1}{2}$ oz.; tincture guaiacum, 1 fluid drachm; water, 8 fluid ounces.

Rub down in a mortar the gums, with a little water gradually added; add the tincture guaiacum, and shake up in a wide-mouthed bottle, and make up to eight ounces with water. I have used this for mounting my plants for the last two or three years, and find that it answers admirably; but am told that gelatine and water, in which is a little corrosive sublimate has been dissolved, is better (applied hot). —*Prosper H. Marsden, Manchester.*

ZOOLOGY.

RE-GROWTH OF FINS AND SCALES IN FISHES.—In May, this year, one of my children caught a small roach in a brook that serves as an outlet to an overflow from the park lake. The weather had for a short time previously been very dry, and the brook had but a few inches of water in its deepest parts. The roach was about four inches long, and was sadly injured by the loss of about half his complement of scales and the whole of the dorsal lobe of his caudal fin, his maimed condition being due, probably, to his struggles in the shallower parts of the brook. The fish was caught by hand, and within a few minutes of capture was placed in my aquavivarium, then occupied by three small carp and a loach, innumerable mollusca, &c. In a few weeks the whole of the lost scales were replaced, and a slight fringe occupied the site of the missing portion of the caudal fin. This fringe gradually developed until now (October 6) the late missing lobe is completely replaced, and the fish is the most active in my miniature pond. I may add that my aquavivarium is only 18 inches square by 8 inches deep, that it is kept on the natural system, and that neither water nor fish have been changed since it was started more than four years since.—*F. C. King.*

SHELLS FROM NIAGARA.—There is a very serious error, involving as it does a totally inaccurate record, in the newly-issued "Proc. of the South London Ent. and Nat. Hist. Soc. for 1887," and as it will be long before it can be corrected in the "Proceedings" for 1888, I venture to ask you to allow me to correct it in your columns. On page 89, I am stated to have sent for exhibition six species of shells from the Niagara River. Somehow, the two notes I wrote for different lots of shells have got mixed up, and of the species mentioned, only *Planorbis bicarinatus* was from Niagara River—all the rest were from Colorado, and the note following about their being also European applies only to the Colorado species. Another Colorado species also found in England is *Physa hypnorum*—I found this near West Cliff this year.—*T. D. A. Cockerell, West Cliff, Colorado.*

MOLLUSCA IN COLORADO.—During the past summer, Custer county has yielded me a fair number of mollusca, including two new varietal forms—*Hyalina arborea*, var. *viridula*, shell semi-transparent, greenish-white, and *Pupa blandi* (Morse), var. *alba*, shell white—these varieties being exactly analogous to *H. alliaria*, var. *viridula*, and *P. marginata*, var. *alba* respectively. Both these varieties, like their analogues in Europe, are much more local than the types, although they occur with them. The only snail of any size we have here is *Patula Cooperi* (Binney), of which the type and var. *confluens* (bands confluent, giving the appearance of a brown shell with a broad white band above the periphery and a white umbilical region) occur in Custer county. The young of *P. Cooperi* are keeled, and are remarkable for a feature which seems not previously to have been noticed, namely, that they have numerous fine spiral ridges of epidermis, that on the keel being especially well developed; in some specimens this condition is so far developed that the shells are beautifully ciliate. —*T. D. A. Cockerell, West Cliff, Colorado.*

THE BEAUTY OF THE LICHEN MARK.—The markings on the wings of moths consist of lines and spots that present a family likeness. Lichens, we presume, came into existence every whit as early as the moth race, and hence it is that the night-moths that sleep on our palings during the sunlight are protected from harm by being patterned to resemble the cushions on which they repose. There is an amazing adaptability in the moth race; a chrysalis can secrete a spot of colour so as to vary the wing pattern of the moth it discloses, and during the expansion of the wing membrane a line may become straighter, or more curved lines may become spots, and spots lines. From such changes we describe species which beget their like. The thinning of the birds has left us moths that are lichen-like, since the more they became like the lichens the better chance had they of escape and mating. Sometimes their caterpillars also feed on the lichens, and then, like the marbled beauty (*Byrophila perla*), a common white fleck on most people's palings, the insect's whole existence is passed at the lichens. Curiously enough this minute moth has a congener, *B. glandifera*, which is only distinguishable from it, in that both itself and its caterpillar more nearly resemble a lichen, but instead of being on that account commoner in this country, it is scarcer. As I am not aware that the sparrows object to the pearlier dainty, and turn out the greener, bigger, and more questionable affair, in spite of its lichen colour and curves, it is not erroneous to suppose a decrease of lichens and an increasing omnipresence of whitewash and mortar as the plausible explanation. When a schoolboy at Bath, I recall making the acquaintance of both these little moths, perla showing up on the grey Bath stones somewhat the earlier. Few fresh lichens now mark the trees of Tyburn and the Fleet, and shed over orchid and primrose tuft the fragrance of

spring; you may meet there with perla, but not with glandifera, which, as the huntsman of the Exmoor stags once put it, contains far too much of the "real creature." There, too, sits the garden carpet-moth on the area window, overlooking its pot herbs, another whity-grey edition of plaster and smoke, with the licheny marks of the British brushwood almost defaced; there crawl domestic spiders ugly as crabs, and more active, wanting the redeeming brand of the lichen; the very sparrows that chirp there seem to want the freckles of their gentility. When the globe is covered over with this new garb of tall houses and goose-foot plots, and artists' models look forth from among every potsherd, we shall see plainer this natural selection of wan and degenerate forms. But though child-like simplicity has flown, the new Caucasian type of man that has thence arisen is fairer than the African and more monkey-like; let us recognise this lost woodland trait, therefore, in virtue and refinement, and as for the moths and spiders and sparrows which do not thus improve, let us preserve for them the woodland whence they derive their lichen mark of silver and of yellow gold.—*A. H. Swinton, Tudor Villas, Gery Street, Bedford.*

BOTANY.

THE BOTANY EXAMINATION OF THE SCIENCE AND ART DEPARTMENT, SOUTH KENSINGTON.—The series of questions propounded by "Inquirer," in August SCIENCE-GOSSIP under the above heading, having elicited no reply in the September number, the following brief attempt to answer some of the queries may be acceptable. The "School of Botany" to which it would be desirable to attach oneself, would assuredly be that referred to by your correspondent as represented by "Vines and Sachs's works." At least, these were the principal authorities studied by myself previously to an examination in botany, in which an honour certificate was obtained. In addition to the above-mentioned works, every botanical article to which one could gain access was studied; but probably a practical acquaintance with the plants themselves, seeking to test every point advanced, as far as possible, by examination of living specimens, helped materially at the critical time. Summer and winter, week in and week out, plants both British and foreign, were laid under contribution to reveal the secrets of their structure, and their affinities to each other. For several years the rule was made to acquire some fresh fact every day, and the spirit of the resolution was carried out, notwithstanding the fact, that an arduous avocation was necessarily pursued as a means of livelihood. By looking after the odd moments, it is surprising how great is the sum of them in a few years. Your correspondent remarks that a friend of his having failed, is at a loss to know wherein the weakness of his paper lies. Possibly the following extract from a report of the examiner in botany may be of interest. "The advanced stage is decidedly weak and unprogressive. The candidates bring no really advanced knowledge to the examination, and attempt questions designedly somewhat difficult with a very moderate elementary equipment, and without even in too many cases a ghost of a notion what the question is aimed at." These remarks apply even more strongly—as is, indeed, always the case—to the honours papers. "Inquirer" next gives a series of questions which may be answered more briefly. It is not necessary to pass all or any of the previous stages to enable a student to succeed in honour; but unless he has passed in one of the previous stages, his teacher cannot claim the grant. The suggestion as to whether the examiners favour lady candidates more than gentlemen, would not hold good in my own case, not being one of the fair sex, and also being the only one who succeeded out of those who sat at the same time. The query as to the limits of the money at disposal is out of my cognizance; but we may surely assume the examiners are gentlemen of honour. At the same time, one may hold the conviction strongly, that there is great room for improvement in the apportionment of grants. Payment by results should be materially modified, and a capitation grant should be accorded for a given number of attendances. The changes here suggested are, I am persuaded, of real importance to the welfare of science-classes generally, and would tend "to encourage the study of science among the working-classes," to quote from your correspondent. The answers to the other queries may be briefly summed up. It is highly improbable that some subjects are more favoured than others, although a new subject would most likely be treated less severely than an old one, as the facilities for acquiring special information are fewer in such a case. The candidate's previous successes, his age and profession, are all matters of detail, that bear chiefly on the grant to be paid to the teacher. I believe it is a fact, that the form filled up by the candidate does not go before the examiner, so that he may be perfectly unbiassed in criticising the work before him. Being persuaded of the value of scientific training upon the youth of our nation, and that if our country is to secure a first position among the producers of the world, it can only be by the use of brains as well as hands, it is to be hoped that all possible encouragement will be given to these classes by those at the head of affairs. *J. S., Luton, Beds.*

A DAY'S WEEDING AT CLIFTON.—At the end of August—I can hardly call it summer this year—I found myself at Clifton Downs with a spare day or two for an examination of the precipitous limestone rocks, perhaps more from a botanical than geological point of view. Wandering over the elastic turf of

the downs, on the zigzag footpaths up St. Vincent's rocks, in the shady glades of Leigh Woods, or by the salt marshes of the Avon, I found the lingering remains of an abundant flora, presenting many points of interest to one strange in this locality. Both the season and place favoured plants of the umbelliferous order. It might be previous want of observation, but I never recollect finding so many species of these confusing genera growing in one district. Accustomed to hunt for plants, this peculiarity struck me at once. Descending to the Avon by the path immediately below the suspension bridge, I noticed *Torilis nodosa* (knotted hedge parsley), a procumbent plant with graceful and feathery leaves, cut like minute parsley and axillary clusters of sessile, inconspicuous flowers succeeded by prickly seeds. On the highest point of the cliffs a profusion of *Fœniculum vulgare* (fennel) grew, with numerous umbels of yellow flowers and filiform leaflets. At the base of the rocks *Apium graveolens* (celery) was quickly revealed, if only by its nauseous smell. I believe it is a fact that the wild plant, growing in moist situations, is poisonous. On the bare rocks *Petroselinum sativum* (parsley) luxuriated; it has all the properties of the garden plant, but the leaves are more bluntly cut, and lack the crinkled appearance. If indigenous at all, I think this is a likely situation. *Daucus carota* (carrot) was abundant, easily recognised by large umbels surrounded by involucrum, each segment of which is divided. *Pimpinella saxifraga* (Burnet saxifrage) is plentiful on the downs, while *P. magna* (great Burnet sax) grows on certain parts of the cliffs. I suppose, independent of size, there are specific distinctions in these two plants; the terminal leaflet being divided into three parts, in the latter species, is perhaps the best marked difference. Growing almost side by side in Leigh Woods I found two species that might easily be confused. The first was the common *Heracleum Sphondylium* (cow parsnip), with tall umbels of evil-smelling flowers, rough stem, and irregularly bluntly cut foliage. The second was of equal size, with similar umbel of flowers, not evil scented, however, and having smooth stems, with leaves perfectly regular, the pinnace tapering to a point; it was the *Angelica sylvestris* (wild angelica). By the roadside *Anthriscus sylvestris* (chervil), *A. vulgaris* (spreading chervil), and *Chærophyllum temulentum* (rough chervil) grew. Although there is nothing rare in the above, I think it instructive to find so many allied genera near together. It is wonderful how easy the identification of the Umbelliferæ becomes when the various species are carefully examined by means of the ripened seeds. Some are rough and bristled, others are ribbed, but smooth; each has a distinct form and peculiarity. I may be pardoned for introducing these remarks, which are not for accomplished botanists, but for the beginner, who is apt to be puzzled by a cursory study of umbelliferous plants, as I have often been myself. It was late in the year for the rare *Arabis stricta*, which finds a habitat on these limestones; I could not find even the seed-pods. But I cannot forbear to mention a deserted patch of waste ground beneath a stone quarry, and immediately beside the Avonmouth railway; covering a small acre of ground a great variety of weeds struggled for existence with each other, common enough for the most part, but yielding a typical collection of British wild flowers in blossom in the later summer months. Within half-an-hour I had observed thirty-eight species of plants; I dare say there were more, but time was limited. Amongst the wealth of tansy, hemp agrimony, figwort, willow herbs, scabious, dyer's green weed, wormwood, toad flax, geranium, flea-bane, marjoram, comfrey, purple loosestrife, St. John's wort, knap weeds, clematis, feverfew, and perfoliate yellow wort, in delightful confusion, I saw a few plants less familiar to me. *Calamintha nepeta* (the lesser calamint) appeared to me a distinct form of that genus; *Inula conyza* (spikenard) = *Conyza squarrosa*, appeared plentiful; *Verbena officinalis* (vervain) was here and there; *Solidago virga-aurea* (golden rod) crowned every rock in full glory; *Helminthia echioides* (ox-tongue) was also attractive, and great masses of *Centranthus ruber* (red valerian) wild as far as I could judge. Growing together were two medicks—*M. maculata*, with black spots on the leaflets, and *M. denticulata*, with circular seed-pods; *Diplotaxis tenuifolia* (wall rocket) grew freely on the rocks—I almost think the smaller species, *D. muralis*, occurred near at hand; mignonette, the rock rose, and other plants were prominent. Altogether this was a pleasant little corner. Wandering about in other directions I saw the remains of *Hypericum Androsæmum* (tutsan), and two of the less common geraniums, *G. sanguineum* and *G. columbinum*, still in flower. In the salt-marshes by the Avon, *Aster tripolium* (sea aster), *Plantago maritima* (sea plantain), and *Armeria marina* (sea sand-wort) flourished. Returning to the downs, *Thalictrum alpinum* (meadow rue) met my eye, with *Hieracium pilosella*, splendid heads of *Carduus nutans*, *Cnicus acaulis*, and an abundance of *Crepis virens*. It should be stated that these names are all taken from Sowerby's "British Wild Plants;" I have not the London Catalogue, and am not familiar with the more recent nomenclature.—*Wayfarer*.

Floral Monstrosities.—It may interest some of your readers to hear of a peloric form of *Lamium Galeobdolon* which I found on Colley Hill, Surrey, in May last. Only a terminal flower exhibited the deviation from the normal form of corolla. The corolla had five regular lobes, each lobe with the usual reddish marks: the calyx was six-toothed, but the other organs were normal. I shall be pleased to hear if any of my fellow readers have observed this form. Mr. James Britten, to whom I showed my

specimen, was much interested, he said it was quite new to him though he had seen *B. album* going that way. I have also a five-lobed corolla of *Veronica agrestis*, found at Caterham. Can you inform me if *Carduus crispus*, variety *litigiosus*, is common in England? A specimen from near Wallington, Surrey, which I have compared with the specimens in the Natural History Museum, closely resembles two specimens collected by Mr. de Crespigny in Surrey and named as above.—*H. W. Monington.*

FUNGUS HUNTING.—At our Annual Fungus foray made in Epping Forest on Sept. 8th, under the direction of our President, Dr. M. C. Cooke, M.A., A.L.S., etc., assisted by Mr. Geo. Massce, F.R.M.S., the number of species obtained exceeded one hundred and forty, and of these twenty had not previously been recorded to the Forest, and no less than five of them were found to be new to Great Britain; of these twenty-nine were microscopical, five of them being myxo-gasters collected by Mr. Geo. Massee. I append the name of the twenty fungi found Sept. 8th, 1888, new to Epping: *Agaricus* (*Pluteus*) *nanus*, **Agaricus* (*Naucoria*) *subglobosus*, *Cortinarius caninus*, *Cortinarius rigidus*, *Hygrophorus calyptræformis*, **Lactarius aurantiacus*, **Russula armeniaca*, **Russula maculata*, *Russula granulosa*, *Russula fallax*, *Cantharellus infundibuliformis*, *Comatricha typhina*, *Comatricha Friesiana*, *Licea applanata*, *Physarum cinereum*, *Fuligo varians*, *Hypoxylon cohærens*, *Sphærotheca pannosa*, *Isaria farinosa*, **Scolecotrichum uniseptatum*. Those marked with an asterisk are new to Great Britain.—*Collis Willmott.*

BOTANICAL EXAMINATION.—Mr. Chas. A. Whatmore has assumed an *ex cathedra* position in answering my questions, and his answers coincide with the notions which the Department endeavour to impress upon the public. I am not so sure that these notions represent the true state of the case. Even if a candidate is unsuccessful, he is entitled to have an opinion of his own, especially if he has spent years in the study of the subject, is well acquainted with its current literature, and has passed several of the earlier stages of the examination. Since my note which appeared in the August number was written, some new light has been thrown on the case. The Botany Examination was held on June 30th, and on June 14th my friend received the intimation that he had not done sufficiently well to make it necessary to attend the practical part of the examination at South Kensington. He then wrote to ask if by that intimation he was to understand that he had failed altogether? On June 20th he was informed that the result would be made known to him in due course. In another month he was finally informed that he had altogether failed. On July 19th he wrote to ask the examiners if it was possible for a candidate to receive the intimation (dated June 14th) and yet pass in the 2nd class of the honours stage? If not, what was the object of keeping the candidate in suspense for another month before he was informed that he had failed? He also made some general remarks upon the examination, and offered to submit his paper to any jury of botanists of whom he had the selection of half, submitting, at the same time, that the questions called for only book-knowledge, and that it was not possible to show practical kdowledge, and confine himself to the terms imposed at the head of the paper as to the manner of answering the questions. On July 30th he received a letter from the Department, stating that the letter to the examiners coustituted a grave breach of the Department regulations, and that had he been examined in any subjects other than botany, his papers in all such subjects would have been cancelled. The obvious reply to this was that the letter to the examiners could not very well influence them in giving their decision after they had given it. What it would have to do with any other subjects that the candidate had gone in for, it is difficult to say. A few remarks on Mr. Whatmore's answers to my questions. (1) In their annually published reports on the results of the examinations, some of the examiners have urged that the candidates did pass the stages successively; and that circumstance, coupled with my own observation, leads me to infer that as far as possible that condition is enforced, although not actually required by the regulations. (2) Of seven candidates for the Honours stage that have come under my observation, only three have passed the second stage, and of them two were ladies who certainly possessed no extraordinary knowledge of botany. (3) With regard to the passes being regulated by the sum available for grants. I have no recent statistics from which that conclusion might be inferred; but a few years ago the amount voted by Parliament for the Department was £319,454 10*s.* exclusive of the Geological Survey. The amount paid to teachers of Science was £43,519 2*s.* 9*d.*, and to teachers of Art £16,415, or a total of £59,934 2*s.* 9*d*, which is less than one-fifth of the whole sum. In other words four shillings in the pound goes into the pockets of those who really do the work, while four-fifths is swallowed up in centralisation, red-tape, official salaries, examiners, inspectors, and printing. It comes out that the little smattering of science that a student gets to pass the first class of the elementary stage costs the country £10, seeing that £2 is the grant to the teacher. I have no doubt that later statistics would show an even greater disproportion. After so much has been swallowed up in expenses, it follows that the number of passes must be limited by the balance available for grants. (4) In my opinion it is not fair that it should be easier to pass in some subjects than in others, without stating in the regulations which are the easy subjects. (5) Whether the form goes before the examiners or not matters little, but (6) the fact that age and profession are

required to be stated indicates that such matters are taken into consideration in granting passes, and that may be done either by collusion between the managers and examiners or by one form going before the examiners. (7) Mr. Whatmore's answer confirms what I have said under No 1. If the amount of grant depends upon the previous highest success, there is a disposition to require the candidate to pass the stages successively. At one time every first-class pass carried with it a Queen's prize, but one condition after another has been imposed until now the number, as well as the value of such prizes must be a mere figment of what it formerly was. (8) If these examinations are not intended to encourage the study of science mainly among the working classes, how is it that grants are not allowed on the successes of students whose incomes or the incomes of their parents are more than £200 a year ?—*Inquirer.*

GEOLOGY, &c.

Amber Hunting in the Baltic.—Between Dantzic and Memel is the home of the amber fishers of the Baltic. Germans call it the California of East Prussia; and, standing under the shadow of the light-house at Brüsterort, where the peninsula juts out into the sea, one can see with the naked eye, on a moderately fine day, the entire stretch of coast from which, for more than three thousand years, the bulk of the amber-supply of the world has been obtained. Twenty, thirty feet deep and more, beneath the sand-dunes that extend for miles around, and form the ocean floor, here are the veins of "blue earth," as it is termed locally, in which the petrified yellow and yellowy-brown masses are found embedded; and a little way out beyond the lighthouse on the Fox Point, where a fleet of black boats generally rides at anchor on the grey-green water, is one of the great amber-reefs of the "Bernstein-Küste," a veritable layer of amber cropping up in the sea bed, and heaped up by the ceaseless action of wind and water. The "blue earth" formation runs far back inland, so that amber can be mined as well as fished, as it, in fact, is in some places in the district. But as the deposit is so much nearer the surface under water, where it is being continually exposed by the gradual sinking of the sea-level, while the ebb and flow of the tide and the frequent storms that occur along the coast help to free the amber from the sand and weeds in which it is hidden, it is found more profitable, as well as easier, to "fish" than to "dig" it. A few years ago digging was largely carried on in the Samland, and assumed almost the proportions of a regular industry. Five or six peasants, not possessing the right to "fish," would combine, and obtain permission to excavate in likely spots on the estates of private persons. The result was profitable, but in the end, the "digging" proved a source of unmixed evil to the locality. The "diggers" began to cheat the proprietors of their proportion of the yield, and invariably concealed a good find. Dealers, who crowded into the district in the hope of picking up bargains, cheated the "diggers." Then people began digging in parts forbidden to them, making what were termed "moonlight" expeditions to promising grounds. Fights with inspectors were of constant occurrence; when disturbed, the ' diggers" had no hesitation in having resort to firearms, and murders became quite common, so that the Government was obliged to prohibit this form of amber-getting. The right to "fish" belongs to the coast villages and communities, and, in parts, to the State. The latter farms out the grounds belonging to it to certain Königsberg and Memel firms. One of these, Messrs. Stantien and Becker, agreed, in 1862, to keep open the waterway of the Frisches Haff—which needs constant dredging—and pay 25 thalers a day besides, if they were allowed to dredge there for amber. That the contract proved not unprofitable to them may be inferred from the fact that, when the six years for which they had tendered expired, they offered two hundred thalers per working day, instead of the original twenty-five. The take of amber at Schwarzort, where the dredging is carried on, was estimated at seventy-five thousand pounds for the working year to about thirty weeks.

NOTES AND QUERIES.

Thrush's Nest on Ground.—I do not think it very unusual for the thrush to build its nest on the ground. I found one this year in a similar position to the one described, in fact I think the thrush is one of the boldest of our nesting birds. I may mention that one nest I found was placed on a piece of rock, jutting out of the banks of a stream, no attempt whatever at concealment being made. To examine the nest it was only necessary to lift it down, and replace it afterwards. How the thrush managed to form its nest in such a position, is hard to say.—*F. W. Paple.*

Liparis Salicis, &c.—Mr. Newman, in his "Illustrated Natural History of British Moths," gives as the coloring of the wings of the satin (*Liparis salicis*) "white, unspotted, delicately silky." I believe this is not quite correct. On a certain day in August last, I captured a salicis, and late in August a salicis came out of a pupa I had, both of which had the white of the wings plentifully sprinkled all over with sort of gold-dust scales, not in the form of spots, but as the general hue of the wing. When the insect has been "out" a few hours (or even a few minutes), the yellow gets rubbed off and white only is seen. The colouring of *Liparis salicis* is well figured in Westwood's edition of "Index Entomologicus." I may note here the great mortality of salicis in the larvæ state. I have at Deal in August examined a great many webs that the larvæ have spun before they turn into the pupa state, and found fully three-fourths shrivelled up, and also a great many eaten by earwigs. Not very many comparatively are "ichneumon stung," the ichneumon pupa being yellow, and only one in

each salicis. I may also here mention that, on August 10th, I caught (near Deal, Kent) a red admiral (*Pyrameis Atalanta*, Hubn.) at about 7.30 quite dusk, but before it was regularly dark. A similar occurrence is mentioned by the Rev. J. G. Wood, but at midnight at sugar.—*G. W. Kirkaldy.*

Unusual Germination.—In October of 1887 my servants found several lemon pips germinating in the lemon. My cook put one young plant into some earth in a flower-pot and kept it in the kitchen window, where it was warm. In three days I found it had doubled its growth, but afterwards it died. The weather had set in very cold. On comparing notes with a friend, I found that at about the same date, she had observed the same abnormal germination in lemons. A gardener tells me that he has often found peas and beans germinating in the pods in wet seasons.—*Clara Kingsford, Canterbury.*

Notes from Wales.—Many travellers through Wales are acquainted with the view at the head of the Nant Francon Pass, where Llyn Idwal lies at the foot of a precipice formed by the Glyders and Y Garn, and probably they have observed a strange chasm in the rocks known as Twll du, or the Devil's Kitchen, through which a little stream falls into the hollow at the head of Llyn Idwal. It is a weird spot, and well worth a visit; but few of those who see it from the shores of the lake ever see it from above, though, perhaps, that view is the more striking of the two. Not only is it interesting as a view, but from a botanist's point of view also, for the rocks forming the chasm are the habitat of many interesting plants. It may be reached by a stiff clamber up the rocks from the lake, or approached from behind from the Llanberis valley. It was by this latter route that we explored it. Leaving the main road a few yards beyond old Llanberis church, a path winds up the hillside past a few cottages, getting gradually less distinct until a wall has to be climbed, which brings one to the open mountain. So far there was nothing much to notice, except some unusually fine specimens of *A. Filix-fœmina* growing by the side of a stream. Following a rill, by which *Saxifraga stellaris* was plentiful, and bearing to the right, a very boggy plateau is reached, lying between Y Garn and the Glyders. *Narthecium ossifragum* was very plentiful, though nearly over. Steering towards the highest part of the latter mountain, a little town—Llyn-y-Curn—is reached, and here the interest begins. The little lake was carpeted with *Lobelia Dortmanna*, the flower spikes being out of the water, but not yet in flower; and at the edges were dense masses of *Menyanthes trifoliata*, which must have formed a beautiful sight earlier in the year. Following the stream from the lake, a few minutes' walk brought us to the chasm, and a few more minutes put us in possession of several plants which we had not seen anywhere elsewhere in the neighbourhood. The walls of the cleft were clothed with *Alchemilla vulgaris*, and *Oxyria reniformis*, though these are fairly commonly distributed, yet here they attained a wonderful luxuriance. The finds were *Geum rivale*, *Thalictrum alpinum*, *Plantago maritima*, *Rubus saxatilis*, *Arenaria verna*, *Silene acaulis* (in fruit), *Asplenium viride*, and *Asplenium Trichomanes.* The latter, though abundant in the Nant Francon valley, was hardly to be found on the Llanberis side. Wandering amongst the rocks, we found also *Galium boreale*, *Solidago Cambrica*, and *Sedum rhodiola.* A *Hieracium*, which may have been *alpinum*, grew tantalisingly just out of reach. Besides these, the ordinary plants of the district were there; but these were enough to compensate for what had been otherwise a rather unproductive expedition. A somewhat similar flora was seen on another day at Clogwyn Dda'r Ardda, a precipice on the right of the Llanberis path to Snowdon, where *Selago selaginoides* and *Cerastium latifolium* were added to the list. *Asplenium viride* was much more plentiful there than at Twll Du, and the parsley fern, *Allosorus crispus*, was in wonderful profusion among the rocks at the foot of the precipice. The stern demands of time prevented a more thorough search in what seemed to be a most promising locality.

Vanessa Antropa.—A very fine fresh specimen of this butterfly was captured, on August 24th, in a chemist's window in this town, and is now in my possession. The border is paler than a continental specimen I have, and it is also slightly larger. From the state of the wings, I should imagine it had but recently emerged.—*F. Stanley.*

A Pilgrimage to Down.—The members of the South Place Institute met at Cannon Street Station on Sunday, the 19th of August, for the purpose of paying a visit to the late Charles Darwin's residence at Down. They proceeded to Orpington, the five miles lying between Orpington and Down being accomplished on foot, the route chosen being that across the fields by "Sunningside" to Farnborough, and from there on to "High Elms," the residence of Sir John Lubbock, who had kindly issued an invitation to the members to visit his grounds. The walk through the shrubberies and woods at "High Elms" was greatly enjoyed, the profusion of wild flowers delighting all the botanists present. The journey was then proceeded with until Down churchyard was reached, and here the family grave of the Darwins was visited. A short meadow walk now brought the company to Down House, where they were most hospitably received by Mrs. Darwin, Miss Darwin, and Mr. and Mrs. Litchfield (the late Mr. Charles Darwin's daughter and son-in-law). The large party was then divided into two portions, and these were severally conducted by Mr. Litchfield through the apartments which Mr. Darwin used at different times as his studies, and had shown to them some of the simple forms of apparatus with which he had conducted his important biological investigations. It was with reverent feelings that the company lingered a few minutes where the great master had spent so many days and years, and all felt it a privilege to be allowed the opportunity of paying a debt of affection to the memory of the great man. Mr. Litchfield conducted the company through the conservatories, and pointed out the Dark Room which Mr. Darwin had constructed so as to observe the effect of perpetual darkness upon plant development. On reassembling at "the House," the company was invited to "four o'clock tea," and at half-past five it set off, accompanied by Mr. Litchfield as far as Farnborough, on the return journey. It might be worthy of note, that the above institute—which has lately appointed Dr. Stanton Coit as its minister—has changed its title from South Place Religious Society to South Place Ethical Society, and a very pleasing service is heard of a Sunday morning, and where may be heard a very able scientific discourse. There are also science lectures, delivered by David Houston, Esq., on "Elementary Animal Physiology"; Miss M. E. Knightly, on "Elementary Biology"; A. Vaughan-Jennings, Esq., on "Advanced Botany," during the week. There is also a very good lending library connected with the institute; and classes are held of

a Sunday afternoon for providing pleasant instruction of various kinds to children of all classes.—*Lester Francis, 16 Wansey Street, Walworth.*

CELLOIDIN.—Will some correspondent oblige me by giving the composition of Celloidin: Watts does not give it, and I cannot find it in the shop here.—*J. B.*

A STRANGE NESTING-PLACE.—On the 11th of June this year, when the steamer "Dunara Castle" on her return from St. Kilda called at Uig in Skye, a shore-boat came alongside to bring on and take off passengers and cargo, as is usual at ports where there is no pier or landing-stage. Behind a suspicious looking jar in the bows of the boat was a nest, apparently a rock pipit's, with four eggs. The boatmen told us that the old bird flew off just as they were leaving the shore, but that oftentimes it would stay on its nest and come out with them. A fortnight afterwards I learned that the eggs had hatched out, and a fortnight later was glad to hear that they had all got away safely. The rock pipit not unfrequently makes its nest in the wreckage of an old boat on the seashore, but this is the first time I have seen or heard of one in a real "live" boat.—*Robert H. Read.*

"PECTEN TIGRINUS," found on Forfarshire Coast at Montrose, taken from the stomach of a flounder (dab), caught by a small boat in July. It seems a complete and full grown specimen.—*B. McC. Barclay.*

WHITE SPARROW.—It may be interesting to note that, on Tuesday, 7th August, I observed an almost pure white specimen of the common house sparrow on Glasgow Green.—*Hannan Watson, Sec. Zoological Society of Glasgow.*

HELIX POMATIA AT LUCERNE.—This species was found very abundantly by myself in the neighbourhood of Lucerne during a recent visit.—*W. Harcourt Bath, Ladywood, Birmingham.*

THERE is at the Hartley Museum, Southampton, amongst the land and freshwater shells, one named *Helix nemoralis* (variety hortensis). Is it a new species, as I do not find it in Dixon and Watson's Manual of 1858, or the handbook by J. W. Williams, M.A., D.Sc., Editor of the "Naturalists' Monthly," published this year? You will much oblige by enlightening me on the subject.—*Archibald Hy. McBean, S. Denys, Southampton.*

THRUSH NEST.—The thrush frequently nests upon or near to the ground, although less often than the blackbird and ring-ouzel. In my experience both the thrush and the blackbird will nest almost anywhere. Often have I found their nests in barns and cow-houses, sometimes placed conspicuously on a beam, at others in holes of the wall caused by the displacement of stones or bricks. I saw this summer a blackbird's nest on a pair of wooden steps hanging against a wall, at Heslingtoe Hall, near York.—*J. A. Wheldon.*

NATURAL HISTORY QUERIES.—In answer to M. A., I believe it is not unusual to find toads in the stomach of fish, especially young toads. Of course the older ones do not frequent the streams so much. I have seen one, three parts grown, taken from the stomach of a five-pound jack. I have seen as many as five pike lying in the shallow in March, but not so close together as to render it possible to snare any two of them at the same time, but still all within a few inches of each other.—*J. A. Wheldon.*

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.

A. B., T. R. D., AND OTHERS.—Answers next month.

S. M.—You can procure splendid specimens of Blue John (coloured fluate of lime) polished or otherwise, at a very cheap rate, by writing to the keeper of the Museum, Speedwell Mine, Castleton, Derbyshire.

TOBY.—Yes, your specimen is a white var. of *Geranium molle.*

J. B.—Celloidin is a preparation of pure pyroxylin, patented for Germany and England under the name of "Schering's Celloidin." Mr. Arthur Bolles Lee, in his splendid "Microscopist's Vade-Mecum," says it may be obtained through the post by writing to "Schering's Grun Apotheke, Wittick and Benkendorf, Berlin."

P. N. (Bolton).—The "Playtime Naturalist" will be issued in the course of next month.

M. J. B.—Your fossil is a very fine internal flint cast of *Anachytes ovata*—one of the commonest of the chalk fossils found silicified.

P. Q. KEEGAN.—The female of the stag-beetle (*Lucanus cervus*).

R. T. ORME.—No better book than Stark's "British Mosses."

JAMES R. BENSON.—You can procure them from Mr. Chas. Collins, 157, Great Portland Street, London, W.

NEMO.—Write to the Hon. Secretary of the Geological Society of Liverpool. He will tell you all about Mr. Morton's book on the Carboniferous Limestone of North Wales.

J. W. ODELL.—Many thanks for the fasciated specimens sent us. These monstrosities are more than astonishing.

EXCHANGES.

OFFERED.—Eggs of pine grosbeak, dotterel, gannet, razorbill, guillemot, puffin, gull-billed tern, sooty tern, fulmar, manx shearwater, storm petrel, clutches of ring-ouzel, stonechat, goldcrest, chiffchaff, grasshopper warbler, dipper, coal tit, l— t— tit, rock pipit, purple martin, lesser redpoll, bullfinch, corn and reed buntings, magpie, green woodpecker, sparrow hawk, kestrel, shag, mute swan, rock dove, capercaillie, golden plover, oystercatcher, common sandpiper, arctic tern, herring gull, and kittiwake; nests with several. Please describe clutches offered in exchange for the above.—R. J. Ussher, Cappagh, Lismore.

OFFERED.—Micrographic dictionary, and Davis's "Practical Microscopy" (new).—Wanted, lantern slides of Scottish scenery—must be good.—H. W. Case, F.R.M.S., Cotham, Bristol.

WANTED, good books on microscopy; will gives slides in exchange.—Henry Ebbage, 344 Caledonian Road, London.

WANTED, a small specimen of *Actinoloba dianthus* for salt-water aquaria, in exchange for coins or eggs.—R. McAldawie, 4 Brook Street, Stoke-on-Trent.

WANTED, a well-set specimen of a hornet (*Vespa crabo*), in good condition, in exchange for good specimens of British land and freshwater shells, or unmounted specimens for microscope, &c.

AUSTRALIAN marine shells (Port Jackson), named, offered in exchange for terrestrial or marine shells from any of the islands of the Pacific.—T. Rogers, 27 Oldham Road, Manchester.

SIXTEEN micro slides (various objects) offered in exchange for some modern illustrated book on botany; list sent, or mutual approval.—D. T, 115 Dynevor Road, Stoke Newington, London, N.

SPLENDID collection of moths and butterflies, over 300 different species (list sent on application), in exchange for Rover bicycle.—Fiennes A. N. Beasley, Ardenham House, Aylesbury.

WANTED, micro slides in exchange for Rutherford's freezing microtome.—R. Suter, 5 Highweek Road, Tottenham.

DRAGONFLIES wanted from all parts of the world for figuring.—W. Harcourt Bath, Ladywood, Birmingham.

DUPLICATES.—*A. adippe, A. paphia, A. euphrosyne, A. selene, G. rhamni, V. atalanta, V. urticæ, P. phlæus, H. sylvanus, H. linea, H. alveolus*, &c. Desiderata, dragonflies from all parts of the British Isles.—W. Harcourt Bath, Ladywood, Birmingham.

NATURAL history specimens and books given in return for dragonflies, set or unset.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED at once, mounted microscopic sides, longitudinal and transverse sections of *Ruscus aculeatus* (butcher's broom). Send particulars, &c., to—Miss Cates, 17 Budock Terrace, Falmouth.

WEST Indian and West African specimens, about sixty kinds, mostly in glass-top boxes, including various seeds, shells, sugar cane, &c.; also snake in spirits, suitable for exhibition or private collection. What offers? Safety bicycle wanted, good make.—W. Pix, 167 St. Thomas' Road, Finsbury Park, London.

NATURAL history books in exchange for microscopic slides or cabinet. Microscopic slides for exchange.—S. Harrison, Dalmain Road, Forest Hill.

WANTED, dentalium and entale. Will exchange for either marine or land and freshwater shells; also curios and memorial brass rubbings in exchange for eggs, other than birds.—Archibald Hy. McBean, S. Denys, Southampton.

OFFERED, cone in cone. Wanted, shells, recent and fossil. Send lists.—J. Smith, Monkredding, Kilwinning.

Pl. dilatatus and *Sph. ovale* from new Lancashire locality, and other land and freshwater shells to exchange. Desiderata numerous.—T. M. Harvard, 41 Union Street, Leyland, near Preston.

Vertigo pusilla, Zon. fulvus, H. fusca, and *H. aculeata*, offered in exchange for *H. camellata, S. oblonga, V. tumida, alpestris, substriata*, or *angustior*.—R. Standen, Swinton, Manchester.

WANTED.—Living and mature specimens of *Zon. nitidus, Zon. excavatus*, and *H. pisana*—a quantity required for dissection. Good British land and freshwater shells offered in return.—R. Standen, Swinton, Manchester.

WANTED, Huxley on "Crayfish," Lubbock on "Ants, Bees, and Wasps," Cooke on "Fungi," all in the International Science Series—must be cheap and in fair condition.—Chas. A. Whatmore, Much Marcle, Gloster.

WILL exchange Newman's edition of Montagu's "Ornithological Dictionary," for Rye's "British Beetles," in good condition.—William Jeffery, Ratham, Chichester.

EXOTIC butterflies. Duplicates: *Pap. Sinon, Agestor, Epycides, Paris, vernalis* (new species), *M. adonis*, &c.; also wings of morphos and uranias. Special desiderata: *Pap. ascanius* (Rio), *Montrouzieri, Dædalus, Crino, Arjuna*, &c. —Hudson, Railway Terrace, Cross Lane, Manchester.

Choice Wenlock limestone, and other good fossils, in exchange for scientific books, chalk fossils, or offers.—A. Y. Ovant, "Cottesville," St. Oswald's Road, Small Heath, Birmingham.

FOR exchange, eggs of cuckoo, kingfisher, ptarmigan, woodcock, goldfinch, dunlon, hawfinch, and many others in clutches or separate. Wanted, one-holed eggs of the common British birds.—Jas. Ellison, Steeton, Leeds.

BACK numbers of the "Entomologist;" also a variety of moths, ova of angularia, in exchange for roots of orchis or sea anemones, &c.—H. Sharp, 23 Union Street, Langham Place, London, W.

FOSSILS from all British formations wanted, in exchange for fossils, minerals, shells, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

FOR exchange, scientific and philosophical books; also a small collection of minerals and rocks. Offers solicited in recent shells.—Miss Linter, Arragon Close, Twickenham.

OFFERED, the following micro slides, Watson's mounts, viz.: "anchors and plates of synapta" (arranged), "group of diatomaceæ, actinocyclus, ralfsii," "foraminifera from Adriatic Sea," and "Selenite, blue and yellow;" also a Maltwood's finder in case. Wanted, original Jubilee sixpences.—W. Mathie, 10 Queen Mary Avenue, Crosshill, Glasgow.

A FEW natural history specimens preserved in spirit, from South Africa, including chameleon, lizard, locust, caterpillar, &c. Exchange as above, or offers.—W. Mathie, 10 Queen Mary Avenue, Crosshill, Glasgow.

CASSELL'S "Popular Educator," 3 vols.; Cassell's "Miniature Poets," 16 vols.; Cassell's "Franco-Prussian War," 2 vols.; Dr. Karl Russ on "The Speaking Parrots;" McKendrick's "Outlines of Physiology;" album containing eighty-eight portraits of actors, actresses, &c., and lot of miscellaneous music for violin, piano, harmonium, &c. What offers?—W. Mathie, 10 Queen Mary Avenue, Crosshill, Glasgow.

MICRO slides for exchange. Wanted, fossils, minerals, or books on natural history.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, Hobkirk's "Synopsis of British Mosses," Plues' "British Grasses," "Outlines of British Fungology," Leighton's "Lichen Flora of Great Britain, Ireland, and Channel Isles," Tripp's "British Mosses," and others. Also *Lolium temulentum*, Linn., and all other gramineæ from all parts of the British Isles. Micro slides in exchange.—Ernest O. Meyers, Richmond House, Hounslow, W.

FOR exchange, Hamblin Smith's "Study of Heat," and Gill's "Chemistry for Schools."—Ernest O. Meyers, Richmond House, Hounslow, W.

T. caput-serpentis (attached), *Cr. anomala* (on stones), *P. 7-radiatus, Lima elliptica* and *subauriculata, Nuc. nitida* and *tenuis, Leda pygmæa* and *minuta, Luc. spinifera, Ax. ferruginosus, Ast. sulcata* and *triangularis, S. siliqua, V. arcuata* (6¼ inches), *Th. prætenuis, Dent. entalis* (live), *Tr. millegranus* (small), *Trich. borealis*, in exchange for other British marine species not in collection.—A. Somerville, 34 Granby Terrace, Hillhead, Glasgow.

Helix Minoricensis, Helix lactea, Helix argia, Clausilia bidens, var. *virgata, Clausilia dubia*, var. *Suttoni, Bulimus decollatus, Vertigo minutissima*, and some other species, in exchange for *Testacellæ*, the pink African var. of *Helix pisana*, and other interesting variations of British species, or shall be glad to send specimens to any requiring them, as long as the stock holds out.—Jno. W. Taylor, Outwood Lane, Horsforth, near Leeds.

WANTED, Baily's "Characteristic British Fossils," Bigsby's "Thesaurus Devonico-Carboniferus," and Nicholson's "Paleontology," new ed.—F. C. King, Bank Villa, Fulwood, Preston.

WANTED, SCIENCE-GOSSIP, Nos. 52, 59, 60, 68–70, 89, 97–108.—F. C. King, Bank Villa, Fulwood, Preston.

OFFERED, SCIENCE-GOSSIP for 1867, 1876–79, and several odd numbers, in exchange for British marine shells, fossils, minerals, &c.—F. C. King, Bank Villa, Fulwood, Preston.

WANTED, *Helix nemoralis* and *H. hortensis* from all parts of the country. OFFERED, *H. Carthusiana, H. Cantiana, H. ericetorum, H. lapicida, H. arbustorum, H. caperata, Bul. obscurus*, and var. *alba*, &c.—Rev. J. W. Horsley, The Avenue, Bedford Park, Chiswick.

A COMPLETE set of reagents and apparatus for qualitative analysis, and Valentin's "Qualitative Analysis" (latest edition). Particulars on application. A good microscope wanted.—Casteel, 15 Kennington Grove, Upper Kennington Lane, S.E.

DARTS of several species of helix offered for British and foreign land and freshwater shells.—W. H. Heathcote, M.C.S., East View, Preston.

OFFERED, darts of *Helix aspersa, nemoralis, hortensis, caperata*, &c. Desiderata, *L. involuta*, several species of *vertigos, Acme lineata*, &c.—W. Hy. Heathcote, M.C.S., East View, Preston.

MARINE shells.—*Pecten tigrinus, Mya arenaria, Tectura testudinalis, Trophon truncatus, Fusus gracilis*. Wanted, other duplicates in exchange, or birds' eggs.—A. Kelly, 5 Canal Lane, Aberdeen, N.B.

A NUMBER of well-mounted and interesting botanical and entomological slides in exchange for any of the recent biological and botanical works, Huxley and Martin, &c.; a violin also wanted.—J. C. Blackshaw, 4 Ranelagh Road, Wolverhampton.

WANTED, ⅛ inch objective to fit Crouch's educational microscrope; also Peter Gray's "Fungi and Lichens" (Swan Sonnenschein).—Chas. A. Whatmore, Much Marcle, Gloster.

WANTED, books on botany, or volumes of SCIENCE-GOSSIP prior to 1886; good microscopic slides in exchange.—J. Collins, 23 Roland Road, Lozells, Birmingham.

WANTED, two or three gross of unmounted micro photos, also superior microscopic slides.—R. Suter, 5 Highweek Road, Tottenham.

WANTED, pupæ or imagos of the larger species of lepidoptera, also some suitable for a beginner; will give in exchange a book-pattern store-box 14 in. by 10 in., corked and papered, quite new.—R. Laddiman, Upper Hellesdon, Norwich.

WANTED, diurnal lepidoptera from all parts of the world. Foreign shells and British birds' skins offered in exchange.—J. T. T. Reed, Ryhope, Sunderland.

BOOKS, ETC., RECEIVED.

"The Senses of Animals," by Sir John Lubbock (London: Kegan Paul & Co.)—"The Star Atlas," translated from the German of Dr. H. J. Klein, by Rev. E. McClure (London: S. P. C. K.)—"Quarterly Journal Royal Microscopical Society," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 13TH ULT. FROM: F. S.—A. C. D.—K. E. S.—I. R. F.—T. D. A. C.—J. B. B.—I. W. H.—J. B.—D. T.—R. G. H.—C. H.—T. D. A. C.—J. H. F.—B.—A. S.—M. S. P.—L. I. G.—R. D. P.—W. P. W.—R. S.—T. T. R.—C. W.—B. B. L. T.—G. C.—H. W. M.—C. A. W.—J. C. B.—A. K.—W. H. H.—R. J. H.—W. A. F.—F. W. C.—H. E.—H. G. D.—J. B. B. M.—C.—R. M. A.—T. R.—J. H. F.—G. T.—H. L.—R. S.—W. H.—G. W.—G. A. B.—W. P.—G. V. C.—S. H.—A. H. Mc. B.—I. S.—T. M. H.—R. S.—C. A. W.—W. J.—H.—A. T. O.—U. M.—J. C.—R. L.—J. H. A. H.—J. E.—F. N.—L.—H. S.—J. H.—E. O. M.—J. W. T.—J. H.—F. C. K.—F. A. P.—W. I. S.—I. A. W.—C. O.—J. S.—T. F. U.—S. L. M.—A. J. H. C.—J. G.—J. I. N.—J. W.—J. C. P.—B. T.—F. W.—J. C.—F. P. P.—T. D. A. C.—G. F. R.—G. D.—W. P. H.—J. H. W., &c. &c.

NOTES ON THE FRONTAL SAC OF THE MUSCIDÆ.

SOMETIMES questions have been put to me on the sense-organs of insects to which I could not give, neither could I find by reference, a satisfactory answer; this was rather humiliating, and led me to try to unravel some of the mysteries of the subject myself. The pursuit is of great interest, and very fascinating, and I wish that I could impart to others the great pleasure that I have felt in the work.

In the older flies, which are often more numerous than welcome in our homes, the frontal sac is not to be seen on the exterior, but in the young insect that has lately escaped from the pupa case it may frequently be seen as a whitish bladder-like protuberance on the front of the head. I have met with very little literature on this organ. Walker merely speaks of it as being alternately projected and withdrawn. Mr. B. T. Lowne, in his "Anatomy and Physiology of the Blow-fly," has given a detailed description of the sac, he says—

"When the perfect fly emerges from the pupa, a large protuberance occupies the front of the head immediately above the antennæ. It consists of a membrane, *by the dilatation* of which the insect bursts off the anterior extremity of the pupa case; when fully dilated it is larger than the head, which is as yet retained within the pupa; but as soon as the latter escapes, this protuberance rapidly collapses and is withdrawn into it. Until the integuments are thoroughly hardened it may be made to protrude from the head by gentle pressure, but is not afterwards visible externally; by pressing back the facial plate, however, a fissure is opened between it and the occipito-frontal plate and cheeks, by which the cavity formed by the retraction of the membrane communicates freely with the external air. The membrane is continuous with the integument at the margins of the fissure; it assumes a bright yellow colour in the mature insect, and is thrown into numerous plications; its connections are best seen from the interior of the head. The extent of its surface is very great, and is much increased by being closely covered with papillæ. It has probably three distinct functions; first, it serves to break off the anterior extremity of the pupa case; secondly, it is *undoubtedly* connected with the humming of the insect, the facial plate being thrown into rapid vibrations during the emission of sound; and lastly, it seems to receive numerous nerve filaments from the antennal nerves, and is probably an accessory organ of smell. From its position I propose the term frontal sac to designate it." He further remarks that—

"The evidence that induces me to include this organ under those of special sense is, that its extensive surface, which is thrown into numerous plications, is still further increased by being covered with blunt papilla. Its internal surface is covered with yellow pigment, and with a thin layer of nerve cells connected with filaments from the antennal nerves. As already stated its cavity is in free communication with the atmosphere, and the air contained must be frequently changed by the vibrations of the antennal plate.

"With regard to the respective share which the antennæ, palpi, and frontal sac, probably have in the olfactory sense, we have little to guide us: but it appears to me likely, that the olfactory organs of the antennæ enable the insect to perceive odours, which are quite inappreciable to the vertebrata. The palpi are probably gustatory organs, whilst I think it very probable that the frontal sac, the nerve supply of which is far more limited, and the structure of which

is far coarser, is especially adapted for the appreciation of the more powerful odours."

From these quotations it is quite evident that the knowledge of the functions of the frontal sac is very imperfect, but as Lowne has made two affirmatives, and one inference, I have tried to confirm him.

As the sac in its earliest stage is external to the head, contains undeveloped cells, which for want of a better term I will call growth cells, and fluid, it is well adapted to the forcing open of the pupa case.

With all due deference to Mr. Lowne's professional knowledge, I think that he is somewhat wide of the mark in stating that the frontal sac is connected with humming of the insect. Besides the brain, nerves, muscle, air-sacs, etc., the head of the insect contains a large quantity of fluid which will necessarily be in contact with the inner surface of the sac, and thus help to counteract any vibrations of its walls. Again, if it remained perfectly dry, the loose plications into which it is formed would yield if the least tension was applied, and thus be anything but conducive to the production of sound. The absence of any muscular attachment to its walls, or other means of compression by which the contained air could be forcibly driven through a narrowed outlet puts this means beyond a doubt, even if it was not borne out by the fact, that there is no provision for regulating the size of the outlet, if it was capable of alterations in size, which it is not. The facial plate, as well as the whole head, doubtless vibrates during the production of sounds by the insect, though it does not follow that the sound must emanate from the head. Any one who has watched a grasshopper when it gives its shrill call, must have noticed the great muscular exertion required to produce the sound, and probably it is so with most insects that have this gift. From the few observations I have made, I think that we shall have to give more attention to the thoracic spiracles before the question of sounds produced by insects is cleared up.

The inference that the sac is an olfactory organ seemed quite feasible, and as Mr. Lowne has given his reasons for arriving at that conclusion, I have tried to follow him. First, I sought for the nerve fibres given off by the antennal nerve to the sac, then for the layer of nerve cells covering the internal surface of its thin walls, but have failed to find either. The yellow pigment is represented in the young fly by the undeveloped mass of nucleated cells, which disappear as the various tissues become perfected. The papillæ appear to be simply thickened elevations of the walls of the sac without any perforation. Epidermal papillæ are present in the base of the halters, but these have a distinct lumen into which a nerve penetrates, but in the papillæ of the frontal sac, nothing of the kind is to be seen. I have therefore reluctantly come to the conclusion, that it is not sensory, but serves some purely mechanical purpose.

Having reached this conclusion, its purpose must be further sought for, therefore, looking at the whole head, I found that the boundary on every side save one, was composed of hard inflexible chitine, but from the one side projected the flexible proboscis. The house-fly and other insects of the same genus have the power of projecting and withdrawing the proboscis at will. I have before stated that the head contains a large quantity of fluid, so does the proboscis. There are also large air-sacs in the head, but these are constructed on a plan to resist external pressure, in some instances they are strengthened by a lining of spiral fibre. Now for a moment, suppose the proboscis to be projected to its full extent, what would happen if it was withdrawn and pressed up towards, and partially into the lower part of the head? The action would most certainly displace some of the fluid contents both of the head and proboscis; fluids being inelastic, some provision must be made for the displacement, or otherwise the act could not be performed. Now the frontal sac, with its elastic folds hanging so gracefully in the fluid, appears to be the very best and simplest organ for the purpose. During the act of projecting the proboscis the air would rush in through the opening in the forehead and inflate the sac, causing its outer walls to become further separated and fill up the space vacated by the fluid. When the proboscis is again retracted, a reverse action of the frontal sac would take place, the air would be expelled and the external walls of the folds approach each other. Thus a uniform pressure on the brain, nerves, and muscles would be maintained, whatever might be the position of the proboscis.

Now this is all very plausible, and things fit as they should do in any well-arranged place, but will it bear testing? With this object in view, I have cut into sections, heads of flies of one and the same species, some with the proboscis distended, others with it retracted. In those with the proboscis distended, I found the space occupied by the frontal sac with its folds proportionately large, in those with the proboscis retracted, the folds of the sac are compressed, and the whole lower portion is elevated, and approaches the upper external wall; in a word, it occupies less space in the head than when the proboscis was distended. The uses of the papillæ are now apparent, for as the external walls of the sac are brought closer together the papillæ interlock and retain a certain portion of air, thus preventing the surfaces adhering to each other, which might be the case if they were perfectly smooth and damp.

I have had to bring this subject before you much sooner than I intended, therefore, have not had the opportunity of confirming this view of the organ, so thoroughly as I should wish, but should it, on further investigation prove to be wrong, and a right one promulgated, I shall be as ready to embrace it as any one. In justice to Mr. Lowne I would remark, that

it is some eighteen years since his valuable work on the blow-fly was published. Since then there have been immense improvements in our methods of preparation as well as the instruments for making sections, which enables us to see the internal structure of these small organs without their tissues being displaced, whilst Mr. Lowne and his predecessors had to depend on their skill and patience in dissection, and such was the wonderful work they did that it will be an everlasting memorial to them.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

THE AIR OF COAL MINES.—Some popular fallacies connected with this subject prevail rather widely. It is natural to suppose that, in the gloomy regions underground, the atmosphere and general climate must be very bad. This, however, is not the case. The climate, as regards temperature, is positively luxurious; cool in summer, and mild in winter.

It is well known that the ponies, taken down to work in the pits, improve so much in condition that a few weeks vacation underground adds materially to their market value, if sold immediately they come up. This is due to the mild, equal temperature. I have described this before, and have been critically overhauled for perpetrating a supposed paradox.

Mr. S. G. Nasmyth has recently conducted a series of physical, chemical and biological observations on the subject, and has communicated his results to the current volume of the "British Medical Journal" (pages 222 to 229). He found that during three months, the highest temperature was 55°, and the lowest 53° Fahr., and that for twenty-one consecutive days, it remained constant at 53°. Victims of bronchitis think of that! Only two degrees of maximum variation during three months, and for three weeks no variation at all!

The chemical composition of the air in reference to carbonic acid, oxygen supply, and organic matter, did not prove quite so favourable; but still it warranted the general conclusion, that the air of coal mines "compares favourably with that of one-roomed houses, schools, and work-shops." Mr. Nasmyth adds, that miners are not unhealthy, and are not particularly affected by phthisis or bronchitis, a conclusion which quite accords with my own experience among the colliers of Flintshire, and that of my friend Robert Platt, who was the medical practitioner of the district, attending all the colliers and their families by contract, *i.e.*, by an arrangement with the proprietors, who paid him a fixed amount for attendance on their employés and their families. He frequently told me that, if the atmosphere of the colliers' cottages and of the public houses had been as good as that underground, his work would have been much lighter.

I observed, however, two peculiarities of the miners, first, their delicate complexions (after removal of coal dust) and their delicate appetites as compared with out of door labourers. The collier cannot digest the hard skim milk cheese, and the fat bacon that is welcome to the farm labourer. I have heard certain useless people (who, earning nothing, deserve to starve) sneer at this daintiness of appetite as an affectation. It is not so; both this and the pale transparent skin are consequences of lacking the natural stimulus of daylight.

Science in Australasia.—We that have not visited the antipodes are apt to regard Australia as altogether a land of sheep runs and shanties. It is rarely associated in our minds with any ideas of cities, cathedrals, universities, and such like old-world developments. With these impressions, however vague, we are naturally surprised to learn that on the 28th of August last, "The Australasian Association for the Advancement of Science," commenced its proceedings with an opening speech by Lord Carrington, followed by Presidential address by Mr. C. H. Russell, and that the sectional meetings commenced on the next day, and continued throughout the week, during which one hundred and ten papers were read on various branches of science, and that the association already numbers about 850 members.

The meetings were held at the University of Sydney; the leading citizens of that city entertaining the visitors with great hospitality, and many pleasant excursions were made by the members of the association. The next meeting is to be held in Melbourne, Baron Sir Ferdinand Von Müller, the government Botanist of Victoria, being the President elect.

The association which, as its name indicates, embraces the whole of Australasia, will meet in New Zealand in 1890. I have not heard whether any invitation from the Fiji Islands has yet come under the consideration of the council.

Surgical Meat Preserving.—We still have much to learn from the lower animals even in the business of meat preserving. At the recent meeting of the British Association, Sir John Lubbock described some of the scientific proceedings of certain solitary wasps. The female of one of these (Ammophila) feeds her young on a full grown caterpillar, which is placed in the nursery cell of her infant maggot. To prevent the inconvenience of struggling meat on one hand, or decomposing meat on the other, the mother-wasp performs very skilfully an elaborate surgical operation demanding accurate knowledge of the anatomy of the nervous system of the caterpillars, which, as some of my readers will remember, consists of a series of ganglia; one set, the supra-œsophagal, from which the nerves connected with vision, &c., radiate, and others at each segment

sending off nerves to each pair of legs, and connected together by commissures running down the length of the body.

The first step of the wasp surgery is to pierce the membrane between the head and first segment of the body and to sting the brain-like supra-œsophagal ganglia of the head, or the commissure cords that connect them with the body in general. This, if we may trust our imperfect human notions of the physiology of the nervous system, is equivalent to the administration of chloroform, as it disconnects the body with the machinery of sensory consciousness.

In higher animals it would produce general paralysis, but not so in caterpillars, every segment having its separate motor centre as above described. The kicking and struggling due to these, although rendered merely automatic, would by the first operation still be inconvenient, therefore this operation is followed by eight others, one perforation and paralysing at each pair of segmental ganglia ; thus paralysing each pair of legs and permitting the young wasp to feed upon the caterpillar segment by segment, without inconvenience, either to the feeder or the food which remains alive, though quiescent up to the last morsel, by virtue of its semi-independent segmentation.

There is another species of wasp, to which I have not been introduced by name, which is carnivorous in its adult stage. This feeds on an animal in which the nervous system is more centralised than in the caterpillar, viz., on a grasshopper, the carcass of which is preserved by a single operation that is performed by throwing the grasshopper on its back, bending back its head so as to open the articulation at the neck, and then piercing the membrane and crushing the supra-œsophagal ganglia by a squeeze of powerful jaws. Paralysis and insensibility are thus at once produced without destroying the thoracic and abdominal nervous machinery which controls the functions of respiration and nutrition.

Thus a living but insensible carcass is stored in the larder, one that may be eaten at once or kept in good condition, or even fattened by administering an easily digestible, nutritious syrup that the wasp collects for the purpose ; none of its working energy is dissipated in supplying the grasshopper with saltatory or other muscular force ; all is economised to do the work of nutrition.

Cat Day at the British Association.—"Every dog has his day," in the ordinary course of nature, but at the British Association, September 7th of this year was largely devoted to cats by the Zoological Section, the chief subject being the heredity of their abnormal toes. Mr. E. B. Poulton described a kitten sent to him from Wales in 1879 with six toes on each foot. The mother of this kitten had seven toes on each of the fore feet ; thus mother and kitten both had twenty-four toes, though not similarly distributed. Then Mr. Poulton's kitten became frequently a mother, her husbands being ordinary twenty-toed cats ; nevertheless in many of her families "a high percentage of abnormality occurred."

One kitten with five toes on the fore feet and six on the hind was given to a friend, which "among many families with a high proportion of abnormality, produced a kitten with seven toes on the fore feet and six on the hind, thus reverting to the condition of the great-grand-parent in the possession of Mr. Vaughan" who gave Mr. Poulton his first kitten. This multiplication of toes is still proceeding among the cousins and nephews and nieces, and later generations.

Miss Lydia Becker described a Suffolk cat with abnormal toes, and others joined in the discussion, all agreeing that the phenomena are very interesting, but nobody appears to have suggested the appointment of a cat committee to investigate experimentally and report annually on the subject of such heredity.

Many years ago—when I was a boy—there lived in Wardour Street, Soho, a pork butcher named Foot, whose children all had supernumerary toes, and were objects of considerable interest in the neighbourhood. We had an old black servant at the time, and I well remember her explanation. Mr. Foot dealt largely in boiled "pigs' trotters," *i.e.* feet ; these were displayed in the shop window, arranged in a row by Mrs. Foot, who served the customers. Black Polly maintained that the contemplation and handling of so many toes by the mother caused the evolution of her children's abnormality—she expressed her theory, however, in somewhat different terms.

The Height of Waves.—Some curious exaggerations have prevailed concerning this subject, and many have been the controversies relating to it. A captain in the mercantile marine, writing to the "Liverpool Mercury," describes his investigations, which appear to have been carefully conducted by viewing, while rounding Cape Horn, the waves that came up astern from the mainmast in a line of sight to the horizon, and marking on the mast the height of coincidence. On measuring the distance from these marks to the mean draught, he found them to be as follows : 64, 61, 58 and 65 feet in height, and that the length of the waves varied from 750 to 800 feet.

Ansted says : "The highest and largest waves do not often exceed forty feet from the crest to the deepest part of the trough," and adds, "when these great waves approach the shore or shoal water, and reach the bottom of the sea they increase in height, reaching sometimes to upwards of 150 feet, but they diminish in breadth or amplitude, and become pointed."

The difficulty of determining the height of waves from a ship is very considerable owing to the instability of the platform on which the observer stands, while the measurement from the shore is easy enough.

Admitting this, it appears to me that Prof. Ansted refutes himself, as the reconciliation of his two measurements, demands that the shore-breaker shall become nearly four times as high as the deep water wave. This may be refuted by simply standing on a steeply-sloping shore at such an elevation that the crest of the shore-breaker shall coincide visually with the horizon. If such increase of height took place near to the shore it would be unmistakably visible from such a standpoint. If it occurred gradually, say within a mile or two from shore, it would be very distinctly observable by the increased pitching of a ship on approaching the shore.

NOTES ON FASCIATION IN PYRETHRUM.

DURING the past summer the conditions favourable to the development of fasciated growth in plants have been prevalent. Wet, comparatively sunless weather, is highly productive of abnormal growth, and in no class of plants has such growth been more common than in the genus Pyrethrum.

The earliest species to flower is *P. roseum* and its varieties, the flowers of which are of two classes, single and the so-called double; in the latter the disk florets are large, tubular, and coloured like the ray florets, the former being simply normal flowers with small disk florets.

There has been a great tendency on the part of the so-called double varieties to assume abnormal forms, the most common being a curious ridge-like formation of the receptacle, giving the flower the appearance of a celosia. In the typical varieties, the flower heads were more or less mis-shapen, some very curiously divided across as if they had been cut with a sharp knife when they were unfolding.

In a large collection of plants here very few escaped without some slight trace of fasciation. In July I looked through some thousands of plants at a large hardy plant nursery, and batch after batch of old-established plants, and one year old seedlings showed the same condition, the more highly-developed "doubles" being affected the worst.

P. parthenium has shown the same abnormal condition and growths, but in this species a curious leafy malformation has been developed in place of the flower heads; this growth greatly resembled the huge outgrowths one sometimes sees on common soft herbaceous plants—an excrescence due ofttimes to the development of adventitious buds, and occasionally to arrested growth. The yellow-leaved variety of this species, known in gardens as "golden feather," when allowed to grow naturally, has been equally prolific during the past summer in producing these curious growths; that they are due to the influence of fasciation is proved by the flattened and twisted stem.

P. uliginosum is a late flowering species, with tall, bold-growing stems, lanceolate leaves and large attractive white flowers. For several years past the plants in the gardens here have shown a strong tendency to produce mis-shapen flowers and stems, the fasciation showing in many instances low down on the stem in the form of a flattened main stem; this flattened condition of the main stem has however not prevented the lateral branches from flowering and producing flower-buds. In this respect it differs from a case noted on p. 50, vol. xxii., where the flattened stem of *Tropæolum tuberosum* failed to produce perfect flowers, buds only being developed, which were abortive. This autumn it is a matter of difficulty to find a single plant of *P. uliginosum* without some trace of fasciation; all kinds of monstrosities are to be found, from the shapeless terminal mass of flowers, to a perfect double flower, double in the sense of having two adherent capitulums on one flower stalk.

This excess of abnormal growth in the genus Pyrethrum was due to the wet season. On cultivated ground the effect of so much wet is to present the plants with an overdose of plant-food, rendered soluble by the continuous presence of rain-water. This is very noticeable in the case of *P. roseum*, a species not so given to abnormal freaks as the last noticed species.

A plant of *P. Tchichatchewii* (native of Asia Minor), growing in a very dry position under trees, has shown no trace of abnormal growth. This is the only species growing here that has been perfectly free from the influence of fasciation. How far its dry position influenced the growth is a matter for experiment another season.

Pinner. JOHN W. ODELL.

LIFE UNDER A STONE.

NATURAL history is a subject on which, in all its various branches, many books have been written. Nature, it has often been said, is itself a book; not indeed one that he who runs may read, but a magic volume to those who study it with care. Some pages there are which seem at first sight blank, but these are written in invisible ink, and need only the fire of enthusiasm and the light of understanding to bring out clear and well-defined the message that they bear. Other leaves are inscribed in characters so strange and mystic, that many a sage has studied them in vain, until, as time rolls on, there is found at last one wiser than the others, who translates the writing on the page aright. The book of Nature is never finished; daily the great Author adds fresh chapters to the work, yet there is never a dull page, and even those which at a glance may seem least interesting, will always well repay a closer scrutiny.

It is with one of these apparently uninteresting

pages of natural history that we propose to deal—with a chapter called: "Life under a Stone." Now a stone is regarded by most of us without interest; it is used in common parlance as the symbol of all that is worthless, all that is dull, hard, or insensible. Yet, the geologists tell us, the mere pebble rolling at our feet may have a history reaching farther back than the history of man. The tale it may unfold is one to which wise men listen with awe and reverence.

It is not, however, with the stone itself that we have now to do, but with the life beneath it. Shakespeare has told us, in an often-quoted passage, that we may find "sermons in stones," but it was reserved for a writer of our own day to show us that there were also sermons under them.

"Did you never," says Oliver Wendell Holmes, in his "Autocrat of the Breakfast Table," "in walking in the fields, come across a large flat stone, which had lain, nobody knows how long, just where you found it, with the grass forming a little hedge, as it were, all round it, close to its edges—and have you not, in obedience to a kind of feeling that told you it had been lying there long enough, insinuated your stick or your foot, or your fingers under its edge and turned it over as a housewife turns a cake, when she says to herself, 'It's done brown enough by this time'? What an odd revelation, and what an unforeseen and unpleasant surprise to a small community, the very existence of which you had not suspected until the sudden dismay and scattering among its members produced by your turning the old stone over! Blades of grass flattened down, colourless, matted together as if they had been bleached and ironed; hideous crawling creatures, some of them coleopterous or horny-shelled—turtle-bugs one wants to call them; some of them softer, but cunningly spread out and compressed like Lépine watches (Nature never loses a crack or a crevice, mind you, or a joint in a tavern bedstead, but she always has one of her flat-pattern live time-keepers to slide into it); black, glossy crickets, with their long filaments sticking out like the whips of four-horse stage coaches; motionless, slug-like creatures, young larvæ, perhaps more horrible in their pulpy stillness than even in the infernal wriggle of maturity! But no sooner is the stone turned and the wholesome light of day let upon this pressed and blinded community of creeping things, than all of them which enjoy the luxury of legs—and some of them have a good many—rush round wildly, butting each other and everything in their way, and end in a general stampede for underground retreats from the region poisoned by sunshine. Next year you will find the grass growing tall and green where the stone lay; the ground-bird builds her nest where the beetle had his hole; the dandelion and the butter-cup are growing there, and the broad fans of insect-angels open and shut over their golden disks, as the rhythmic waves of blissful consciousness pulsate through their glorified being."

The description is as graphic as are all word-pictures from the same pen, and the subsequent passage—the "sermon"—giving the meaning of the little parable is too pretty to be left unquoted, though it has, perhaps, but little bearing on our subject. "The stone," our author goes on to say, "is ancient error. The grass is human nature borne down and bleached of all its colour by it. The shapes which are found beneath are the crafty beings that thrive in darkness, and the weaker organisms kept helpless by it. He who turns the stone over is whosoever puts the staff of truth to the old lying incubus, no matter whether he do it with a serious face or a laughing one. The next year stands for the coming time. Then shall the nature which had lain blanched and broken rise in its full stature and native hues in the sunshine. Then shall God's minstrels build their nests in the hearts of a new-born humanity. Then shall beauty—Divinity taking outlines and colour—light upon the souls of men, as the butterfly, image of the beatified spirit rising from the dust, soars from the shell that held a poor grub, which would never have found wings had the stone not been lifted."

The living creatures beneath the stone are in the foregoing quotation, perhaps partly to serve the purpose of the allegory, painted in colours somewhat darker than need be, and it will be our task to try and point out that, as there is "good in everything," so there is beauty even in the common-place; and to arouse, if possible, some interest in the life-history (not less curious than that of the hugest mammal) of the tiny beings which constitute this "community of creeping things."

Suppose, then, that during a ramble through wood and field we come upon a stone lying half-buried in the grass or fern which has grown up round it, and turn it over, what kind of creatures shall we find beneath it? The stone may differ according to the district in which it is found; in one place it may be a bit of granite boulder, in another some other sort of stone, but the "little population" under it is always nearly the same. It may vary a little, for instance, if the stone does not lie quite flat, and there are crevices beneath roomy enough to accommodate beetles; we may find some of these hard-coated gentry, but even if the stone seems to lie so close that nothing living could squeeze between it and the ground, yet there will be creatures under it, and one thing we are certain to see, on turning the stone over, is a congregation of woodlice.

Now though the woodlouse is such a common and familiar object, most people know so little of its anatomy as to fall into the error of calling it an "insect." But an insect, to be properly so called, must have neither more nor less than six legs, a body divided into three distinct parts, and must breathe through a system of air-tubes dispersed over the body. The woodlouse clearly does not answer to this description, therefore it is not an insect. To

what tribe, then, does it belong? Many of our readers will doubtless be surprised to learn, that the crawling thing they have always considered as an insect is in reality a crustacean; that is to say, it belongs to the large family of crabs, and is a cousin, though a distant one, of the little creatures whose odd sideway movements in the rock-pools left by the retreating tide are the delight of children at the seaside.

At least three species of woodlouse are common in England, yet few people, except naturalists, know how to distinguish them. The first and perhaps most generally known is the "pill-woodlouse," the scientific name of which is *Armadillo vulgaris*, in allusion to the odd likeness it bears with its hard shelly covering to the armoured quadruped so-named. The pill-woodlouse seems really clad in mail, for the horny surface of its carapace has the bluish gleam of steel, and is as polished as a knight's cuirass. Moreover the armour of the woodlouse is even superior, in point of make, to a perfect suit of harness finished by the hand of the most skilled of ancient armourers. For it is so cleverly jointed, that it not only does not interfere in the least with the free movements of its owner, but it actually enables the latter to roll himself into a ball, each segment fitting one into the other and presenting a shining impervious sphere to the attacks of every enemy. Its striking resemblance, when thus coiled up, to a pill, has given to the woodlouse its English name, and it is said that in the earlier days of medicine they were actually used by druggists. How this may be we know not, but certain it is that they have been employed by many a schoolboy in very unpleasant practical jokes.

The second species, the common woodlouse (*Porcellio scaber*), is devoid of this ability to roll itself up, and this constitutes one of the differences between it and the first-named. The colour is much the same as that of the pill-woodlouse; but it is not nearly so polished, and is sometimes spotted with white. The chief mark, however, by which the two species may be distinguished, is the projection in the common woodlouse of the abdominal appendages beyond the carapace. In the pill-woodlouse these do not appear.

The third species is the land-slater (*Oniscus asellus*), and this kind also does not roll up. This woodlouse is known by its having eight joints in the antennæ, whereas the others have only seven. It has also two rows of yellow spots, and the same number of white spots along the back. All the species have seven pairs of legs, equally developed.

Woodlice, like other crustaceans, breathe air by gills; but it is essential to their well-being that the air they breathe should be saturated with moisture. Accordingly, they never object to shelter under a stone, otherwise conveniently situated, on the score of its being too damp, though they occasionally prefer, as a refuge, a rotten log, or some other piece of decaying timber. Damp and darkness are their delight, and the light of day is hateful to them; they will take advantage of any retreat to avoid it. Hence they are sometimes found in the galleried nests of the hill-ant (*Formica rufa*), where its hosts do not interfere with it, and, indeed, seldom take any notice of this uninvited guest.

Their food is chiefly of a vegetable nature, and as they are very sharp-toothed little creatures, they are rather destructive in gardens, and where they abound it is not easy to get rid of them. Fowls will eat them readily, and when woodlice are too plentiful, the inhabitants of the hen-house may be let loose upon them with great effect; only that in a well-kept garden we are apt on such occasions to find—as the ancient Britons found when they called upon the Romans to fight their battles for them—the invaders more formidable enemies than those they were intended to drive out.

In the order Isopoda, to which woodlice belong, the young are developed within a larval membrane, and when they are liberated by the bursting of the membrane, they nearly resemble the adult, with the exception of having only six pairs of legs instead of seven. The respiratory system is curious. The seat of the organs of respiration is the lower surface of the abdomen, these organs consisting of leaf-like branchiæ, or gills, protected by plates folding over them.

Woodlice are not by any means the only creatures to be found under stones. Almost as common, perhaps, as these are the millepedes, strange little beings, in appearance something between a hard-bodied caterpillar and a centipede. These are sometimes called "wire worms," but quite erroneously, the real wire-worm being the larva of the click-beetle (Elater). Their bodies are perfectly cylindrical; they are generally from an inch to an inch-and-a-half in length, and though they have not really a thousand legs, as their name implies, they have a goodly number, namely, from a hundred and sixty to two hundred. These feet look almost like a fringe of delicate white hairs, and, as the millepede glides along, the movement of its many legs imparts a kind of rhythmic wave-like motion to its whole body, which is pretty to watch.

Three species are common in England. The first, and perhaps best known, is called *Julus sabulosus*; its colour is dark greyish-brown, with two reddish lines running down the back. The common millepede (*Julus terrestris*) is the second species, a little smaller than the first, and distinguished from it by lacking the two reddish dorsal lines. The third species (*Glomeris marginata*) is sometimes called the "pill-millepede," and is even mistaken for the pill-woodlouse, from its habit of rolling itself up spherically. The other millepedes roll themselves also when touched or disturbed, but in a flat spiral, like a coil of wire. The pill-millepede may really

easily be known from the woodlouse, from the fact that its legs all originate on a single line in the middle of the under-surface of the body, so that when the creature is walking, the legs do not appear at all beyond the edge of its shelly covering. It is much shorter than *Julus sabulosus* and *Julus terrestris*, and has from seventeen to twenty-one pairs of legs.

Fig. 107.—Group of Centipedes—1, *Glomeris marginata*; 2, *Julus terrestris*; 3, *Polydesmus complanatus*; 4, *Polyxenes*; 5, *Geophilus longicornis*; 6, *Lithobius forficatus*; 7, *Scutigera coleoptrata*.

The millepedes feed on decaying animal and vegetable substances, and seldom, if ever, attack living vegetation. Thus they are useful as scavengers, clearing away much refuse which would otherwise taint the air. They are nocturnal in their habits, as are most of the creatures which find a refuge under stones, and in order to see them in the day time, we must search in such haunts as these. They come out with the bat and the owl, and in the dusk of the evening may be found taking their walks abroad.

In the spring the female millepede sets herself industriously to work to scoop out a hole in the earth, which she intends as a cradle for the reception of her future offspring. When the hole is finished, she makes haste to deposit therein sixty or seventy eggs, which remain about three weeks before they

are hatched. When the young millepedes make their first appearance in the world, and prepare to enter upon their humble but useful career, they are entirely destitute of the many limbs which are destined to adorn them when adult. Each also bears—as a newly-hatched chicken sometimes does—the two halves of its egg-shell attached to its body by a filament. At a later period of their existence, they are endowed with three pairs of feet, and are then enabled to disencumber themselves of the egg shells. They might easily be mistaken at this time for the larvæ of some beetle. In the further stages of their development, they gradually acquire additional segments and additional limbs, until they finally resemble in shape and size the parent form.

One rather unpleasant peculiarity of nearly all millepedes, is their disagreeable odour, arising from an acrid fluid secreted from cutaneous glands on the dorsal surface of the body. The pores from which the secretion exudes, are two on each segment, and have sometimes been mistaken for stigmata. The real stigmata are, however, placed in pairs close to the bases of the legs.

The millepedes belong to two families of the class Myriapoda, and we must now turn our attention from the Julidæ and Glomeridæ to the representatives of two other families (Lithobidæ and Geophilidæ) of the same class, namely the Centipedes.

The name of centipede is misleading, like that of millepede, and is commonly applied alike to the above-mentioned two families, the members of which differ in appearance considerably. The centipede is an inhabitant of most parts of the world, and in the tropics it grows to such a size as to be quite a formidable creature. All the centipedes have foot-jaws, or maxillipedes, armed with perforated hooks communicating with poison-glands ; hence their bite is always painful, and that of the large foreign species produces sometimes serious effects. The Lithobidæ are pre-eminently dwellers under stones, and to this habit of life they owe their name, which is composed of two Greek words, the former signifying a stone and the latter to live.

Several species of Lithobius are found in England, but the commonest is *Lithobius forficatus*, which must be known to every one who has seen stones, flower-pots, or old rubbish turned over or removed. It is a flat, segmented, shining, reddish-brown creature, from an inch to an inch and a half in length, with a pair of long jointed antennæ rather redder than its body, and fifteen pairs of rather yellowish legs. These numerous limbs carry it very nimbly out of sight if it is disturbed in its hiding-place, but it is a creature of a decidedly irritable disposition, and should it be captured or otherwise interfered with, it does not hesitate to inflict a savage bite with its sharp curved nippers.

Most of the centipedes are chiefly carnivorous, and therefore need not be feared by gardeners ; they prey upon insects, worms, and other small animals, and are useful in a garden to keep these within reasonable numbers. One species of centipede, however, though it lives generally upon the larvæ of insects and other soft-bodied creatures, occasionally departs from the rule of flesh-eating to join the ranks of the vegetarians ; it is not proof against the temptations of a ripe peach, apricot, or plum, and may be sometimes found neatly coiled up in the heart of the fruit. Not infrequently, too, it takes advantage of the hole made by a greedy slug in the side of a fine strawberry, to sip the sweet juices. This little robber rejoices in a name almost as long as itself; it is called *Arthronomalus longicornis*. The total length of this centipede varies from two and a half to three inches; its colour is lightish yellow, the head inclining to a rusty hue ; it has long hairy antennæ, and from fifty-one to fifty-five pairs of legs.

The female seems to b full of solicitude for her offspring, for after having laid from thirty to fifty eggs in a hole in the ground, she coils herself up round them, and remains in this attitude until the young hatch, a period of two or three weeks. The young of centipedes, like those of millepedes, do not exactly resemble their parents at first, but go on acquiring additional segments, or somites, and limbs, until the adult form is reached. This result takes, in the case of centipedes, a long time to attain, and the growing process is not completed until after a series of changes of skin, or "moults."

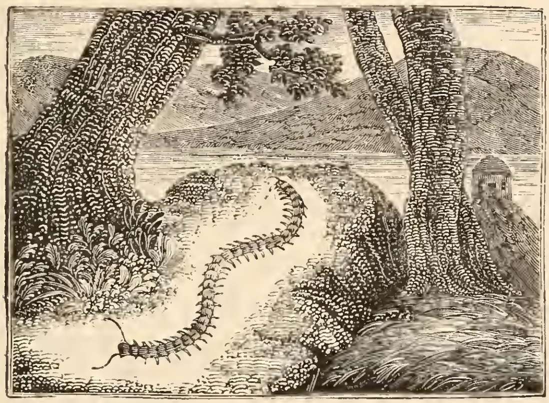

Fig. 108.—*Geophilus electricus*, the phosphorescent centipede.

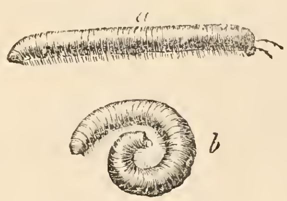

Fig. 109.—*Julus terrestris.*

Centipedes are nocturnal creatures, but *Arthronomalus longicornis* renders itself very conspicuous in the dark by a peculiar power of giving out a phosphorescent light, almost as strong as that of the glowworm, in consequence of which it is liable to be mistaken at night for that more legitimate lantern-bearer. The luminous property is common to both sexes.

In writing of "Life under a Stone," we must not confine ourselves to describing merely one or two of the creatures seen in such localities. We have spoken of woodlice, millepedes, and centipedes, but our history would be incomplete did we not now leave the subject of crustaceans and myriapods, and devote ourselves to the consideration also of the insects which may be found associating with them. Foremost among these is that one of "Nature's flat-patterns," which of all others can adapt itself to the tiniest crevice without risk of crushing a frame fearfully and wonderfully made. The earwig (*Forficula auricularia*) is as common under stones as it is in flower-beds, and though it cannot be denied that in the latter place at least it is harmful, though it is almost universally regarded with disfavour, not to say disgust, yet its history presents points of interest which the lover of Nature cannot choose but study. The place of the earwig in natural history was for long a vexed question, but, according to the latest classification, a section of the Orthoptera has been raised to the rank of a distinct order, called Euplexoptera, on purpose for its reception.

The appearance of this insect is too well-known to need description, but its habits are not so familiar to most people. Many are even ignorant of the fact that it has wings, of which it makes use at night. The structure of the wings is very beautiful, and the manner in which they are folded under the short elytra most curious. On alighting after a flight the earwig proceds to stow away its wings, and this it does most cleverly, using the formidable-looking forceps at the end of its tail to facilitate the process of packing. The wings are folded, unlike other insects, both longitudinally and transversely; they are very large and membranous, and it has been suggested that to their shape, which somewhat resembles a human ear, the insect owes its name, the word earwig being corrupted from "ear-wing." This is much more probable than the ridiculous statement, invented to account for the name, that the insect enters the ear, and thence penetrates to the brain of a person, causing madness. Any one with any knowledge of anatomy knows that even if an earwig got into the ear, it would find no passage to the brain.

The earwig is a vegetable feeder, and is apt to choose the petals of flowers as its especial diet, hence its destruction by gardeners. The female earwig lays her eggs in a cavity in the ground beneath a stone, and her care for her young is extraordinary, only finding a parallel in that of a hen for her chickens. She watches over her eggs incessantly, collecting them if scattered, and moving them about from place to place in order to obtain for them a suitable degree of moisture. Some naturalists assert that she actually incubates her eggs by sitting on them, but the accuracy of this statement seems not to have been conclusively proved. Even after the young are hatched, the mother earwig remains a long time with them, and does not cease to tend them until they are able to shift for themselves. The young earwigs differ slightly from the adult form in all the three successive stages of their development, but the differences are not sufficiently striking to need description.

Other insects there are, such as some beetles and spiders, which are sometimes found under a stone, and about these much that is interesting might be said, but they are generally only casual visitors, and not regular inhabitants of this retreat, therefore we need not enter upon their history here.

To those, however, who have been sufficiently interested in what some may think a dull chapter in natural history to wish to read farther in it, we may offer the advice to go out into field and wood, and see for themselves how much yet remains untold of "Life under a Stone."

LILIAN J. GOULD.

ABNORMAL GROWTHS ON FOREST TREES.

By ROBERT COUPAR.

THE forester in his daily walks through woods and plantations meets with many curious growths on the stems and branches, roots and other parts of hardwood and coniferous trees.

These consist of knots, swellings, cavities, engrafted trees and roots, as well as many other curious growths. Queries are many times asked regarding these growths, and great diversity of opinion exists regarding them. I intend to offer a few remarks respecting my ideas as to their cause and origin.

First of these is the effect of the ivy and woodbine upon tree stems. The ivy is a beautiful evergreen, seen growing upon any old wall or ruin, and also upon decaying trees or stumps; but there is a limit to which it should be grown upon young trees. In its young state, when the tendrils are small, there is not much damage done, but when the stem becomes of considerable thickness, and the foliage begins to cover the whole top and branches, then serious results accrue therefrom. In young plantations under thirty years of age, supposing that ivy is permitted to grow on the trees and allowed ample freedom, its growth is remarkable, and will soon overtop the trees, sadly interrupting the breathing organs, the leaves, as well as the bark, which manufactures, so to speak, the wood.

The natural habit of the ivy is to grow straight

up the stem, seldom entwining in a screw-like manner, as in the case. of the woodbine. The smaller leaders of the ivy encircling the stem as they increase in growth and thickness become so tight upon the stem as to prevent the natural expansion of the bark ; hence the annual layers of the wood are much less should the ivy not be removed and allowed to grow unchecked. The annual woody layers become less and less, and ultimately become scarcely traceable. The ascending sap also becomes less and less, and the leaves turn smaller, paler, and decay sooner. They also expand later, and feeble terminal shoots

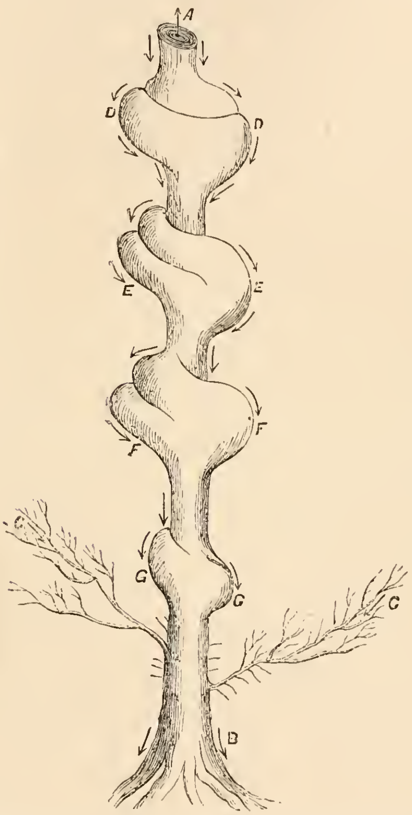

Fig. 110.—Stem of Common Alder showing bulges caused by Woodbine. The arrows indicate the course of the descending sap.

are produced, in short the whole system is affected and sadly crippled, and as a natural result, the tree dies.

Woodbine, or honeysuckle, differs in its growth upon trees from taking quite a serpentine habit, seldom growing upon the stem in a straight manner. From the habit of growth, many curious turns and bulges are found in woods where this twiner is allowed to grow unchecked. The illustration given herewith represents a correct drawing from a common alder growing by the water's edge. The woodbine had died away, and no traces of it could be found ; but from the specimen, evident proof is shown of its damaging effect. *A b* the stem, *c* the branches, *d e f g* are bulges caused by the twining of the woodbine. By referring to *d* this bulge is nearly round and round ; this is caused by the creeper being almost directly round the stem, preventing the expansion of the bark, and checking the descending sap ; *e* and *g* are in more of a slanting direction. This sort of form is the commonest to be found ; *g* is where the woodbine was in so much a longer circle than either of these described, that the creeper did not offer so much resistance to the bark when expanding, hence there is less bulge. When the creeper is nearly horizontal round the stem, the largest bulges

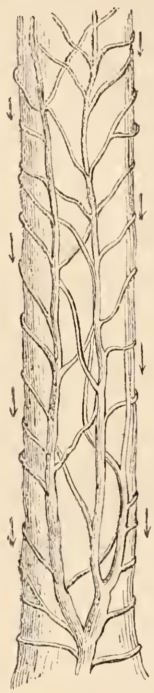

Fig. 111.—Tree stem showing the direction taken by Ivy stems and branches, with which it is covered.

will be formed. Again, suppose a stem of ivy, three inches diameter, to be growing up the side of the stem of a larch or other tree, when the bark expands to allow of the yearly deposit of wood, the ivy is gradually pushed out with the bark, and no bulge is produced on the stem ; but, again, should thick branches ramify round the stem so as to completely encircle either a stem or a branch, the bark will expand so far yearly as the ivy will allow with freedom ; then gradually the ivy will offer great resistance to the bark, and if not removed at this stage, bad results are sure to be looked for.

In the case of the woodbine, however, the result is somewhat different, as the stem of the tree increases in thickness, as also does the stem of the woodbine.

From the encircling nature of the climber, it will present a greater resistance to the bark when expanding, until the two become perfectly tight and expand no longer at that part where the creeper is pressing on the stem; then a bulge is produced, as shown in the illustration. This goes on yearly until the creeper breaks or dies, or is enclosed in the growth of the tree. The sap is prevented from descending in a straight direction, but moves round in a screw-like manner as shown in Fig. 110. Now, will this bulge heal over when once this creeper is taken away? Well, in the case of small bulges, it will during a few years; but such swells or bulges as *d e f* will increase for years, indeed during the whole life of the tree sometimes. Now, how is this explained? On account of this bulge the descending sap will always be checked at that part, and impeded in its flow from the abundance of sap at this particular part; more wood will be formed at the broadest part above than will be formed at the hollow or narrower part below; such bulges as that will rarely heal up while the tree lives.

THE QUESTION OF NOMENCLATURE.

THERE is much discussion now going on on this side of the water among botanists, about the citation of authorities after specific names, and even the right of priority of these names seems to be called into question. For instance, in "Botanical Gazette," 1888, p. 234, we have some remarks by Mr. F. L. Scribner—"Pursh described *Stipa membranacca*; Thurber, ignorant (as almost every one was) of Pursh's name, called it *Eriocoma cuspidata*; it turns out to be an Oryzopsis; ought Scribner to go back to Pursh's specific name, *membranacca*, or is he right in calling it *Oryzopsis cuspidata*, Scrib.?" Now here is a strangely confused state of affairs—the prior name and prior author lost sight of altogether, and a new name adopted simply because the original generic determination was incorrect! Surely, if there is to be any uniformity between Zoological and Botanical nomenclature, the grass must be called *Oryzopsis membranacea* (Pursh)—or if preferred, the authority can be written "(Pursh) Scrib.," to show that Scribner first called it an oryzopsis. Another example occurs in the same journal ("Bot. Gaz." 1888, p. 144), in which the prior name is put aside. "*Selinum grayi*, n. sp.," is described by Messrs. Coulter and Rose; but they themselves state that it is the species described as *Archangelica gmelini*, &c. in "Flora of Colorado," and in Coulter's Manual. Now it is not an Archangelica, nor is it De Candolle's species *gmelini*, but it is the *gmelini* of Porter and Coulter, and later of Coulter, and as this specific name appears not to be preoccupied in *Selinum*, the plant should surely stand as *Selinum gmelini*. In the face of these strange views of the question of priority, it is refreshing to read a letter from A. De Candolle ("Bot. Gaz." 1888, p. 244) insisting on the strictest priority of the specific name, unless it has to be abandoned for any imperative reason, e.g. a prior identical name in the same genus.

Zoologists seem fortunately almost all agreed on this question of priority—but there is one point which seems still to demand attention. Is it permissible that the generic and specific names should be identical? For instance, Linné described the blackbird as *Turdus merula*; it is now placed in the genus *Merula*, Leach; should it be called *Merula nigra*, Leach, or *Merula merula* (Linn.)? Rightly, it seems to me, many prominent ornithologists (including Mr. Bowdler Sharpe of the British Museum) have taken the latter view, so that the right of priority may not be infringed, even though the genus and species are named alike.

It is hard to see, indeed, where the inconvenience of these duplicated names comes in, and it is to be hoped that in other branches of zoology and in botany the same rule may be adopted.

Allowing the priority of the specific name, the question now arises which author is to be quoted—the author of the name, or (supposing it has been moved to a new genus) the author who first placed it in the genus? I think all zoologists, and most Cryptogamic botanists, would say, "the author of the name," but for some strange reason, almost every student of phænogamic botany has adopted the latter alternative. For example, the house-sparrow is *Passer domesticus*, Linn., not *P. domesticus*, Leach, but *Convolvulus sepium*, Linn., on being transferred to *Calystegia*, becomes *C. sepium*, R. Brown!

Surely every one will agree that this want of uniformity is unfortunate, but how is it to be remedied? Consider, for a moment, what is the purpose of citing the authority after a name? Is it not as a guide to enable us to find the original description on which the prior right of that name to indicate the species is based? If so, how can the name of the author who only first placed the species in that genus help us? Not at all, if the specific name is allowed priority, as insisted upon by A. De Candolle, whatever genus it is placed in, *Oryzopsis cuspidata*, Scrib. has priority, perhaps, over the combination "*Oryzopsis membranacea*," but the specific name *membranacea* is ages antecedent to Scribner's or Thurber's appellation—a fact which is entirely lost if we quote *Oryzopsis membranacea*, Scrib. instead of Pursh. So here again the question becomes, as before, which is to have priority, the specific name alone, or the combined generic and specific names?—and I trust the vast majority of systematists, for uniformity's sake, if for no other reason, will reply in favour of the first alternative, and accept the necessary alterations of nomenclature enforced by that rule.

But whatever changes we are obliged to make, let us make them as soon as possible, since every time an error appears in print, it becomes more difficult of correction, and more confusing to future generations.

T. D. A. COCKERELL.

West Cliff, Colorado.

ASTRONOMY AND METEOROLOGY.

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

THE Astronomical Society of France had a very interesting meeting on the 3rd of October, with Mr. Flammarion in the chair as president.

A description and drawing of the great Solar spot of November the 12th, to the 25th, 1882, was communicated by M. Ricco, of Palermo. This was the largest spot ever observed, its area being more than fifty times as great as the area of the earth's orbit. A drawing of the lunar crater, Eratosthenes, was communicated by Mons. Gaudibert, which showed twelve hills in the ring, and a considerable number of small craters on the eastern side.

Mr. Isaac Roberts has contrived an admirably efficient method of engraving the stars of astronomical photographs in copper plates, so as to retain the accuracy of the original negatives. Mr. Roberts' stellar photographs are said to equal any produced in France.

It is stated that the President of the University of Southern California, Los Angeles, has applied to the firm of Clark's respecting their ability to construct a refractor forty inches in diameter. The discs for the 28-inch Greenwich refractor are completed.

Government has, it is said, accepted Earl Crawford's offer to present his valuable instruments now at Dun Echt to the nation, and the Treasury will furnish the requisite funds for the erection of suitable buildings to contain them, near Edinburgh.

In December Mercury will be an evening star in the first half of the month.

Venus will be an evening star throughout the month.

Mars will be an evening star during the whole month.

December 3rd, Mars will be at the least distance from the Sun, 6 hrs. aft.

December 20th, Mercury will be at the greatest distance from the Sun.

December 31st, the earth will be at the least distance from the Sun.

Rising, Southing, and Setting of the Principal Planets at intervals of Seven Days in November.

	D.	Rises. h. m.	Souths. h. m.	Sets. h. m.
MERCURY ☿ .	2	6 26M	10 51M	3 16A
	9	7 0M	11 7M	3 14A
	16	7 34M	11 26M	3 18A
	23	8 2M	11 46M	3 30A
	30	8 25M	0 8A	3 51A
VENUS ♀ . .	2	10 41M	2 28A	6 15A
	9	10 42M	2 37A	6 32A
	16	10 38M	2 45A	6 59A
	23	10 30M	2 52A	7 14A
	30	10 19M	2 57A	7 35A
MARS ♂ . .	2	11 18M	3 24A	7 30A
	9	11 4M	3 19A	7 34A
	16	10 52M	3 14A	7 38A
	23	10 34M	3 8A	7 42A
	30	10 18M	3 2A	7 46A
JUPITER ♃. .	2	8 11M	0 12A	4 13A
	9	7 51M	11 51M	3 51A
	16	7 31M	11 30M	3 29A
	23	7 12M	11 10M	3 8A
	30	6 52M	10 49M	2 46A
SATURN ♄. .	2	9 16A	4 47M	0 14A
	9	8 48A	4 19M	11 46M
	16	8 20A	3 51M	11 18M
	23	7 50A	3 22M	10 50M
	30	7 20A	2 53M	10 22M

Meteorology.—At the Royal Observatory, Greenwich, the lowest reading of the barometer for the week ending 20th October, was 29·82 in. at the beginning of the week, and the highest 30·23 in. at the end of the week. The mean temperature of the air was 43·5 deg., and 7·5 deg. below the average. The direction of the wind was variable. No rain was measured during the week. The duration of registered bright sunshine in the week was 24·5 hours, against 35·2 hours at Glynde Place, Lewes.

For the week ending 27th October, the highest reading of the barometer was 30·28 in. on Monday morning, and the lowest 29·80 in. on Thursday afternoon. The mean temperature of the air was 49·2 deg., and 0·2 deg. below the average. The general direction of the wind was S.W. No rain was measured during the week. The duration of registered bright sunshine in the week was 25·5 hours, against 23·6 hours at Glynde Place, Lewes.

For the week ending 3rd November, the highest reading of the barometer was 30·12 in. at the beginning of the week, and the lowest 29·23 in. on Friday morning. The mean temperature of the air was 50·3 deg., and 3·0 deg. above the average. The general direction of the wind was S.W. Rain fell on six days of the week, to the aggregate amount of 2·68 in. The duration of registered bright sunshine in the week was 3·8 hours, against 4·0 hours at Glynde Place, Lewes.

For the week ending 10th November, the lowest reading of the barometer was 29·56 in. at the beginning of the week, and the highest 29·71 in. on Saturday morning. The mean temperature of the air was 42·1 deg., and 2·6 deg. below the average. The general direction of the wind was easterly.

Rain fell on three days of the week, to the aggregate amount of 0·20 of an inch. The duration of registered bright sunshine in the week was 12·5 hours, against 10·6 hours at Glynde Pace, Lewes.

For the week ending 17th November, the lowest reading of the barometer was 29·23 in. on Tuesday morning, and the highest 39·01 in. on Thursday evening. The mean temperature of the air was 50·5 deg., and 8·3 deg. above the average. The general direction of the wind was southerly. Rain fell on four days of the week, to the aggregate amount of 0·40 of an inch. The duration of registered bright sunshine in the week was 8·6 hours, against 7·4 hours at Glynde Place, Lewes.

The isotherms or lines of mean temperature for December again fall. On the east coast and in the midlands they are almost in the form of the letter U; while towards the west coast they run almost north-east to south-west. The lowest isotherm 39°, runs from the Firth of Forth, through Sunderland and York, nearly to Leicester, trends inland, and then back northward through Derby, Bradford, and Carlisle to Dumfries. 40° runs from Middlesbrough along the east coast to Ramsgate then inwards through London, and northward through Oxford, Worcester, and Chester, to the Solway Firth. 41° runs southward through Liverpool, Hereford, and Bristol, and then takes an easterly direction through Salisbury and Winchester to Canterbury. 42° runs from Denbigh through Devon and Dorset to the Isle of Wight; from 43° to 45° run nearly parallel to each other, much farther towards the west, while 46° only just crosses Cornwall near the Land's End.

The mean rainfall for December is two inches for the east coast and Midlands, three inches for the south coast, and from four to five inches on the west coast.

MICROSCOPY.

The Royal Microscopical Society.—The last Journal of the above society, in addition to the usual summary of current researches relating to zoology and botany, contains the following papers, both copiously illustrated:—"On the Reproductive condition of *Orbitolites complanatus*, var. *laciniata*," by H. B. Brady, F.R.S.; and "Notices of New Infusoria Flagellata from American fresh waters," by Dr. A. C. Stokes.

New Slides.—Mr. A. C. Cole has just brought out some very remarkable new slides, mounted in his well-known neat and clean manner. One is a vertical transverse section of the human eye (stained) showing all the parts from pupil to optic nerve. The second is a similar section of the eye of greenfinch. The third slide shows the optic nerve entering the eye of a greenfinch.

BOTANY.

A New Grass Fungus.—Last August I collected a grass fungus, which I had not seen before, near Red Creek, Custer Co., Colorado. The specimen was sent to Mr. J. B. Ellis, who replied, "This seems to be a Uromyces. It is quite different from *U. graminicola*, Burrill, the spores being much like those of *Uredo graminis*, but on distinct pedicels." This presumed new species is therefore called provisionally *U. castaneus*. Among the larger fungi, recent additions to the Custer Co. flora are possibly new species of Inocybe (*I. occidentalis*) and Mycenastrum (*M. fuscum*), which, however, require further investigation; and *Polyporus adustus*, Fr., which was found on a conifer. Mr. Ellis writes that it is common at Newfield (New Jersey) on deciduous trees.—*T. D. A. Cockerell, West Cliff, Colorado.*

Colorado Algæ.—Mr. F. Wolle has recently examined a gathering of algæ from Short Creek, Custer Co., Colorado, at about 8,400 feet alt., and in it he finds four species new to my list, viz., *Vaucheria geminata*, *Closterium cucumis*, *Fragilaria capucina*, and *Diatoma* (*Odonitidium*) *hiemale*. He has also kindly examined a gathering from near Mace's Hole, Pueblo Co., in which he finds *Cocconeis pediculus*, *Gomphonema capitatum*, and *Melosira varians*, the two last being additional to my Colorado list, which now numbers thirty species, against twenty-five recorded for the neighbouring state of Kansas. It should be stated that Colorado, from its dryness and lack of many permanent pools or slow-flowing rivers, is not favourable for the growth of freshwater algæ.—*T. D. A. Cockerell, West Cliff, Custer Co., Colorado.*

Floral Monstrosities.—Some twenty years ago, in a botanical ramble in company of Mr. A. Grugeon and Mr. R. G. Keeley, both of the Working Men's College in Great Ormond Street, I saw several examples of the abnormal form of *Lamium galeobdolon* mentioned by H. W. Monington. The locality was that part of Epping Forest, known as the Hawk Wood, near Chingford; and the discovery was first made by one of my friends, I think, Mr. Grugeon. On that occasion we obtained ten or twelve specimens, in each of which the stem terminated with a flower having a corolla of five regular and equal lobes. The other parts of the flower—calyx, stamens, &c.—were not so constant, the stamens ranging from five to seven or eight in different plants, the calyx teeth varying also in number, and I think the pistil was absent or imperfect in all of them. In every instance it was a solitary, terminal flower that deviated thus from the ordinary form. In three or four successive years, a few similar specimens were found by myself in the same vicinity, but none with perfect carpellary organs. Specimens were forwarded by Mr. Keeley

to the late Professor Darwin, who courteously noticed and commented on them in his work on "Variation in Plants and Animals under Domestication." Several years subsequently I became possessed of a copy of De Candolle's "Vegetable Organography," and discovered that that eminent botanist had, at least as early as 1836, noted and described this form, and given its simplest and most feasible explanation as the fusion of two opposite axillary flowers terminating a stem which, under unfavourable conditions, had failed to produce the usual ultimate internode terminating with a pair of leaves.—*C. J. Savage.*

White Flowers.—I have had in my garden this summer several beds of *Eschscholtzia Douglassi*, and in one of them I noticed a plant bearing two white flowers, an occurrence I believe to be very uncommon, and one which may perhaps interest Mr. Cockerell and others. Both flowers were much inferior in all ways to their more conspicuous and brilliantly-attired companions. Each flower measured one inch and a half in diameter; and the petals in each case were smaller than those of the common variety. At the base of the petals of the first flower a tinge of pale yellow was faintly perceptible; but on the petals of the second flower not the slightest tinge of yellow was visible; this I consider is rather singular. Both flowers were proterandrous, and diurnal, usually closing at sundown.—*J. H. A. Hicks.*

Clifton Botany.—In your last issue there appears a bright and chatty account of some of the autumnal wild flowers to be seen during "a day's weeding at Clifton" at the end of August. If I may judge from his concluding paragraph, the writer does not lay claim to critical knowledge of the plants, and it is much to be regretted that his notes upon them were not compared with the recently published flora of the district; or submitted, before publication, to some competent friend who would have pointed out the errors they contain. I beg permission to make the following comments in correction. 1. *Pimpinella magna* does not grow within many miles of Bristol, and has never been found upon the cliffs of the Avon gorge. 2. It is very improbable that *Anthriscus vulgaris* was seen near Clifton. Hitherto it has been quite unknown in the locality. 3. The calamint found by "Wayfarer" in the deserted quarry is either the menthifolia form of *C. officinalis*, or *C. Acinos*. *C. Nepeta* would be gladly welcomed if it could be proved to exist at Clifton. 4. The "wormwood" noticed at the same spot is mugweed (*Artemisia vulgaris*). *A. absinthium* is not a Clifton plant. 5. The Diplotaxis so common by the Avon below Clifton is *D. muralis.* Its woody-stemmed biennial variety is often mistaken for *D. tenuifolia*, which species is also abundant on the other side of the city in St. Philip's marsh, and occurs on walls elsewhere. 6. *Thalictrum alpinum* is of course not to be seen nearer than the Welsh mountains. Nor does the meadow-rue (*T. flavum*) "meet the eye" upon our downs, though it grows in the next county a couple of miles down the river, on the other bank. Mistakes of this kind are the bane of naturalists engaged in working out local botany, and when published in a scientific journal they continue to give trouble for generations, a consideration which has induced me to pen these remarks.—*James Walter White.*

Unusual Germination.—Under the above heading I find, in the November number of Science-Gossip, an account of lemon pips germinating in the lemon. I remember observing a similar occurrence some years ago. All the pips in a lemon were germinating, and many had pushed out the radicle, and the plumule was appearing. I planted them and placed the pot in a hot bed, where they flourished for some time. Two or three which escaped the ravages of the slugs grew into fine little bushes. I have also at other times seen pips germinating in oranges and lemons—the fruit being in good condition.—*A. E. Mahood, M.B.*

Notes on the Flora of the North Downs.—In the above notes (Science-Gossip, Sep. 1887), I made two mistakes in the list of plants. The first, *Gentiana campestris*, I named from a specimen of Amarella which had four sepals, and a four-lobed corolla. I have since found one or two other specimens like it. The other, *Orchis militaris*, should be *O. fusca.*—*Henry Lamb, Maidstone.*

Var. of Asplenium ruta-muraria.—While collecting in Headley Lane last October, I found on a wall well-known to me from its luxuriant growth of interesting mosses, a form of *Asplenium ruta-muraria* which is quite new to me. It was growing with the common form of the plant, and differs from it in its smaller size and in the character of its fronds. Each frond consists of a solitary pinnule, reniform and obscurely tri-lobed, with margins and sori like those of the ordinary form. The pinnules measure from $\frac{1}{4}$-inch to $\frac{3}{8}$-inch broad, and about $\frac{1}{4}$-inch long. The appearance of the plant is very different from that of Ruta-muraria.—*H. W. Monington.*

ZOOLOGY.

Argynnis Adippe.—During August of 1887 I caught a specimen of *Argynnis adippe*, in worn condition, near the river and Midland Railway in Wisbech, Cambs, and having seen in the "Fenland" that only one previous capture is recorded, viz. in 1876, I thought it might be interesting to mention it.

H. Virgata, var. alba.—I have lately been fortunate in finding a locality near Llandaff for the transparent-banded variety of *Helix virgata*, called

var. *alba*. It occurs in company with *H. caperata*, and it is interesting to record that I have taken a single specimen of Caperata similarly banded on the same bank. In September I also took this variety of *H. virgata* at Brixham (Devon), sparingly, and observed that the banding of the transparent shells was exactly the same as that of the coloured forms with which it lived. Sufficient specimens were obtained of either kind to distinguish the predominance of vars. *bifasciata* and *leucozona*. Next to these ranked the type. The only other locality where I have ever met with *H. virgata* var. *alba* is near Bordeaux Harbour, Guernsey, also I believe an unrecorded habitat.—*Brockton Tomlin.*

H. Nemoralis, var. sinistrorsum.—While collecting shells at West Drayton this summer I came across a sinistral *Helix nemoralis*. The specimen is a dead one, and has a small hole punctured in the last whorl, otherwise it is in fairly good condition and scarcely bleached. Besides varieties of Nemoralis I have found here *H. arbustorum* and *sericea* in profusion. —*F. G. Fenn, Isleworth.*

Helix Nemoralis, var. Hortensis.—The shell thus labelled in the Hartley Museum, Southampton, is a well-known form, and the name appears in all standard works on Conchology and in most of the reputed lists—sometimes as a species and sometimes as a variety. It differs from *Helix nemoralis* in being smaller, in having a white lip, and with a dark stain on the columella. Opinion is about equally divided as to its being a good species, but having regard to the intermediate forms, and for the convenience of systematists, I think the balance is in favour of according it generic rank.—*J. T. Marshall, Sevenoaks, Torquay.*

Helix Nemoralis (var. Hortensis).—In answer to Mr. McBean, this shell should be *Helix hortensis*. It was customary with the older workers to consider it merely a variety of *Helix nemoralis* and not a distinct specific form. That will account for the discrepancy of the nomenclature of the land and fresh-water shells used in the Hartley Museum and in our more modern text-books. To-day it is recognised as a distinct species, not only on account of the smaller, and more conoidal form of its shell and its white or rose-coloured peristome, but also on account of the differences between the two forms in their internal anatomy, especially in the odontophoral membrane or radula, the shape of the *spiculum amoris*, and the number and character of the digitate glands. In my "Handbook," to which Mr. McBean refers, *Helix hortensis* and its varieties will be found described on p. 111; *Helix nemoralis* and its varieties on pp. 110 and 111.—*J. W. Williams.*

Anodonta Cygnea and Anatina.—I had expected Mr. Williams replying to Mr. W. M. Webb on this subject touching the distinctness of *Anodonta cygnea* and *anatina*. Failing any answer from Mr. Williams I may just point out, that the "weight of evidence" is greatly in favour of the two forms being separate species. Mr. Webb has adduced Gray, Forbes and Hanley, Isaac Lea and Dr. Henry Woodward as authorities holding that anatina is but a variety of cygnea. Against Mr. Webb's authorities I set the following: Lamarck, Fleming, Macgillivray, Alder, Bean, Jeffreys, Taylor and M. Drouet. I believe all these well-known conchologists have regarded the smaller, angular, winged, and usually greenish form of anodon we call anatina to be a distinct species. Dr. Woodward and a few other antediluvians, who have a strong dislike to the trouble and expense of rearranging their cabinets, might as well argue that all the species of continental anodons are one, and that *Unio tumidus*, *Unio pictorum* and *Unio ovalis* are all one, because there are a few difficult graduating forms between each two species. *Helix nemoralis* and *Helix hortensis* were one till proved by their darts to be two.—*George Roberts.*

Sense of Smell.—Anent the opinions lately expressed in our daily papers and journals as to the value of dogs as trackers of criminals, I am of opinion that even the feeble trials of indifferently trained, and in some cases altogether untrained animals, have been sufficient to prove that some of our canine friends are eminently qualified for detective work. Sensory impressions are very strong in the canine race, and although traffic and other causes may have obliterated in some places the scent to be followed and given rise to other effluvia—yet (especially in well-trained dogs), the impression first made upon the organ of smell, is, I believe, retained sufficiently long to enable the animal to pick up the trail under great and seemingly insurmountable obstacles. The extremely moist state of the mucous membrane lining the nasal passages in the dog intensifies the various odours which are conveyed by the respiratory current through the nostrils, and this is especially so in connection with the thin delicate olfactory mucous membrane which is supplied with the special nerves of smell whose function is to receive odorous impressions and transmit them to the encephalon. In blood or sleuth hounds, and also in the old southern hound, the olfactory mucous membrane is highly sensitive—thus accounting for the keen sense of smell in these breeds and their adaptability for tracking "by nose."—*Woodroffe Hill, F.R.C.V.S.*

NOTES AND QUERIES.

Ferns.—The proliferous ferns described by your correspondent, E. E. Lowe, may have been planted there by the owner, who might have been collecting such varieties. It is rather surprising that Scolopendrium was not amongst the number of sports, as it is

very prone to produce a proliferation of the apex of the frond.—*J. A. Wheldon.*

Mists and Mice.—I have noticed that the mist forming on the river Medway (and, doubtless, the same on other rivers) at night smells strongly of mice. What is the cause?—*H. L. D.*

Penarth Entomological Society.—It may be interesting to your readers to hear that, at a meeting of the Penarth Entomological Society, held on the 18th inst., Mr. J. L. Howe exhibited two specimens of *Colias Edusa* caught on the 16th about two miles from here, he having seen no less than six specimens and also one *Grapta e-album.* Allow me to report that *Plusia gamma* has been very abundant about here this summer, specimens appearing at sugar being remarkably bright and well marked. *P. cardui* has also been very plentiful.—*G. A. Birkenhead, Hon. Sec.*

Mimicry in Plants.—I found numerous specimens of *Geranium molle* in one clump near Penzance. These were on the roadside and there were no white flowers near, except a few late specimens of *Capsella bursa-pastoris.* The central flowers of the clump were completely white, but the outer ones had the exterior of their petals slightly tinged with pink. This may assist your correspondent in deciding whether the colour arises from mimicry or poorness of soil. These specimens were of quite the average size, but they were certainly growing on a thin soil.—*W. P. Winter.*

Pauca Verba.—On Prof. Drummond's Natural Law. 1. In "Conformity to Type," he says the protoplasm of plant, animal, and man cannot be distinguished one from the other, and further on, The mineral furnishes the material for the vegetable; the vegetable for the animal, etc. 1. Then how is it possible that the vegetable and animal protoplasms are indistinguishable? 2. All life is correspondence with environment. 2. With what environment does original thought correspond? 3. The whole organism out of correspondence with the whole environment is death. Part of the organism out of correspondence with its environment is dead. 3. The whole and the part are not alike dead; in the latter case the correspondence may be restored; in the former, never. Partial paralysis may throw certain organs of the brain out of correspondence with their environment, but there is a possibility of its being restored, strictly speaking, they are not dead; whereas life once departed cannot be recalled. 4. Prof. Drummond cites a deaf man, as being insensible or dead as regards sound. 4. Part of the body other than the brain, out of correspondence with environment, scarcely implies that the organism is in that relation dead; the organ of the power in the brain is not even insensible; it is out of correspondence, because the indirect organ or instrument of communication is impaired; this is seen in a case of injury to the drum of the ear, when the substitution of an artificial one immediately re-establishes correspondence. All conscious correspondence is dependent on the brain; thus it is suspended during sound sleep or a swoon; in insanity correspondence is imperfect, because the brain is impaired. In this world the spiritual correspondence is no exception to this. The spiritual does not supersede the organic as the organic does the inorganic, it is carried on in connection with it. All correspondences appear to cease at death. There is no trace of the organism which is to correspond, "post-mortem," with the same spiritual environment; it must be carried on under different conditions. Finally this theory of correspondence seems to involve conditional immortality; future life depending on spiritual correspondence.—*Charlotte Hellmann.*

Water-Spider.—I read the article on the water-spider, in your issue for September, with much interest. I have at present a specimen of this creature which has made a good-sized nest, and I expect it will soon breed. The writer of the before-mentioned article says that the spider is very ferocious at this time, and on the approach of a water-snail (*Planorbis corneus*) as the animal was too large to attack, the spider turned it from its course by tickling its horns. This morning (Oct. 10th) I observed one of the same snails on a stalk of *Anacharis alsinastrum* just by the nest. As soon as the spider noticed the mollusc, it came out of the nest and gave the snail a few "pecks" with the spine-like organ in front of the mouth. This caused the planorbis to draw in its horns, and at length it altered its course, when the spider returned to its nest. The snail was not very large, but of moderate size.—*F. P. Perks.*

Teeth of Glow-worm.—Mr. Arthur Ayling is incorrect in saying that the teeth of a glow-worm are unable to pierce the skin. When living in Surrey, where they especially abound, I kept one for some months, and can attest, from my own personal experience, that little *Anguis fragilis* can draw blood, though in my case it was not followed by any inflammation.—*Laon.*

A Queer Place foe Shells.—On Saturday, October 20th, the manager of the Gannow Weaving Shed, Burnley, told me they were cleaning out the engine cistern, and that if I went down I might find something interesting to me, as he had noticed a number of shells in it. Being curious to know what they might be, I took my apparatus, and was soon on the spot. We ascended to the cistern which is on the top of the engine-house, and about sixty feet above the canal from which the water is pumped. The water had been drawn off, leaving a few inches of mud, among which were *Sph. corneum* and *Sph. lacustre.* The sides were covered with long silky confervoids, among which were numbers of *V. piscinalis*, *B. tentaculata*, a very pretty form of *L. peregra*, very much like *succinea*, both in form and texture, *P. albus*, *P. corneus*, *P. nitidus*, a few *P. glaber*, and the very local *P. dilatatus* occurred in thousands, of which I obtained some immense specimens. This species is very small in the canal below, but here they were much larger than the specimens mentioned by Mr. J. Russell Wildman, in the September number, as inhabiting the paper-works lodge. I attribute their large size to the fact, that the water is kept at an equal temperature all the year round. The vegetation in the cistern consisted of the before-mentioned confervæ and *Anacharis alsinastrum*, among which were any number of beetles, caddis-worms, &c.—*F. C. Long, Burnley.*

Battle between a Snake and Hedgehog.—A friend in America has sent me a very interesting account of a battle between a hedgehog and snake. His account is as follows: While I was up in the woods I witnessed a most remarkable fight. It was nothing less than a pitched battle between a snake and a hedgehog. I was sitting on a rock in the shade, when I saw the hedgehog. I had my gun in my hand, and was about to fire at the animal, when something peculiar in his actions caused me to wait and see what he was up to. He was crawling along the ground cautiously. Looking ahead of him a few feet, I saw a big snake coiled up, evidently asleep.

The hedgehog stole up noiselessly within about three feet of the reptile, then suddenly sprang forward and caught the snake's tail in his teeth. Then quick as a flash he rolled himself into a ball, and seemed to be awaiting an attack. The snake so rudely awakened from its slumber came angrily towards its enemy and began striking at him with its fangs. At each bite the snake's mouth was lacerated by the hedgehog's quills. This, of course, made the reptile furious, and it darted back and forth, first to one side and then the other of its assailant. The latter watching a favourable opportunity sprang forward and again seized the snake's tail in his teeth, then rolled himself up as before. The snake struggled and bit and twisted this way and that, but the hedgehog still held on. The reptile was bleeding at the mouth and began to show signs of exhaustion, but it kept up the struggle as long as it was able to move. Finally, when it was completely played out, it became still. The hedgehog then unrolled himself, ripped the snake open and proceeded leisurely to devour it.—*Dipton Burn.*

LIPARIS SALICIS.—My experience in breeding this moth is that when fresh from the pupa the wings are tinged with yellow, which very soon changes to pure white. I believe this is caused by the fluids contained in the wings (when fresh) not being completely absorbed into the wings, for if you handle them at this time, the wings are quite limp. This year I have bred and examined a very large number of these moths. In August, I found them in all the stages at Southport, viz.:—ova, larvæ, pupa, and imagos. The specimens before me at present do not show any signs of the yellowish appearance, but are all pure white.—*F. W. Paple, Bolton.*

HELIX NEMORALIS VAR. HORTENSIS.—The shell referred to by Mr. McBean is a well-known one which he will find fully described in Jeffrey's "British Conchology," vol. i. pp. 186–187. The variety differs chiefly in colour, the mouth of the shell being white-lipped while the type (nemoralis) is reddish-brown or black.—*J. MacNaught Campbell, Glasgow.*

[At one time I remember having seen little bottles of coloured sand arranged like pictures. If I remember aright they are sold in some of the watering places on the south coast of England. Can any reader of SCIENCE-GOSSIP say where they are to be obtained?—*J. M. C.*]

WHITE SPARROW.—The sparrow observed by Mr. Hannan Watson is no unusual sight in Glasgow. White and pied varieties of the common sparrow have for many years been familiar to me here in Kelvingrove Park, where I have from time to time seen them, for the past eighteen years at least. In the exhibition grounds yesterday (Sunday 4th Nov.) I noticed a female, whose flight feathers were entirely white, contrasting strongly with the soot-begrimed colour of its companions with whom it was feeding, and in the month of August last I saw four pied birds, probably from the same nest, in a group of about a dozen feeding near the museum in the park. —*J. MacNaught Campbell, Glasgow.*

PRESERVING GAULT FOSSILS.—Can any of your readers suggest a method of preserving fossils of the Gault from decay? I find that those which I have got from the coast (Folkestone) are crumbling away of heir own accord. Is there any solution they can be coated with that will prevent this?—*J. H. A. Verinder.*

DEPILATION.—Would you kindly inform me, through the medium of your valuable paper, the best means, to your knowledge, for the prevention of human hair falling out in large quantities?—*W. M.*

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.

EXCHANGES.

DUPLICATES.—Blackbird, thrush, missel thrush, hedge sparrow, house sparrow, starling, robin, whitethroat, swallow, greenfinch, and chaffinch; also in shells, *L. stagnalis* (fine), *H. virgata*, and var. submaritima of same.—Desiderata, very numerous other eggs, shells, and many butterflies.—N. Hewett, 3 Wilton Terrace, Fulford Road, York.

WANTED, *Helix fusca*, *H. revelata*, *H. pygmæa*, *Bu. montanus*, &c., in exchange for other land and freshwater shells.—John Radcliffe, 111 Oxford Street, Ashton-under-Lyne.

FOR exchange, land and marine shells from Gibraltar and Tangier, and freshwater from the Engadine. Desiderata, rare British forms, or any foreign shells not in collection. Lists on application to—F. W., Drapers' College, Tottenham.

OFFERED, darts of *Helix aspersa*, *nemoralis*, *hortensis*, *caperata*, &c. Desiderata, *L. involuta*, several species of *Vertigos*, *Acme lineata*, &c.—W. Hy. Heathcote, M.C.S., East View, Preston.

WANTED, Vols. IV. Morris's "British Birds," and Bree's "Birds of Europe," also Wallace's "Malay Archipelago," in exchange for Vol. I. Morris's "British Birds," mounted birds, coins, &c.—H., 26 Market Place, Newark.

FOR exchange, eggs of cuckoo, kingfisher, ptarmigan, woodcock, goldfinch, dunlin, hawfinch, and many others, in clutches or separate. Wanted, one-holed eggs of the common British birds.—Jas. Ellison, Steeton, Leeds.

SPLENDID collection of moths and butterflies, over 300 different species; list sent on application. Will exchange for Rover bicycle.—Fiennes A. N. Beasley, Ardenham House, Aylesbury.

T. caput-serpentis (attached), *Cr. anomala* (on stones), *P. 7-radiatus*, *Lima elliptica* and *subauriculata*, *Nuc. nitida* and *tenuis*, *Leda pygmæa* and *minuta*, *Luc. spinifera*, *Ax. ferruginosus*, *Ast. sulcata* and *triangularis*, *S. siliqua*, *V. arcuata* (6½ inches), *Th. prætenuis*, *Dent. entalis* (live), *Tr. millegranus* (small), *Trich. borealis*, in exchange for other British marine species not in collection.—A. Somerville, 34 Granby Terrace, Hillhead, Glasgow.

CHOICE Wenlock limestone, and other good fossils, in exchange for scientific books, chalk fossils, or offers.—A. Y. Ovant, Cottesville, St. Oswald's Road, Small Heath, Birmingham.

WEST Indian and West African specimens, about sixty kinds, mostly in glass-top boxes, including various seeds, shells, sugar-cane, &c., also snake in spirits, suitable for exhibition or private collection. What offers? safety bicycle wanted, good make.—W. Pix, 167 St. Thomas's Road, Finsbury Park, London.

NATURAL history books in exchange for microscopic slides or cabinet. Microscopic slides for exchange.—S. Harrison, Dalmain Road, Forest Hill.

FOR test scales of podura (*Lepidocyrtus curvicollis*), send stamped envelope to—Joseph Wall, 42A Everton Brow, Liverpool.

WANTED, micro slides in exchange for Rutherford's freezing microtome.—Suter, 5 Highweek Road, Tottenham.

DARTS of several species of helix offered for British and foreign land and freshwater shells.—W. Hy. Heathcote, M.C.S., East View, Preston.

WANTED, wings of damaged butterflies of a brilliant character (exotic), which will do for microscope mounting, in exchange for mounted or unmounted parasites.—28 Haverstock Hill, London, N.W.

WANTED, a good book on spiders; will give good exchange. —W. J. Fuller, 91 Tamworth Road, Croydon.

FOSSILS from all British formations wanted, in exchange for fossils, minerals, shells, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

WANTED, *S. virescens*, *S. oblonga*, *Z. radiatulus*, *Pupa ringens*, *H. carthusiana*, all the vertigos except *antivertigo* and *pygmæa*, and many varieties. Offered, large examples of

N. pictorum (4½ inches), and many other land and freshwater shells.—W. A. Gain, Tuxford, Newark.

SCIENCE-GOSSIP, from 1868–87, inclusive, handsomely bound, ten vols. perfect. What offers in microscopic accessories, a good objective preferred?—G. Horn, 57 Bell Street, Calton, Glasgow.

FOR exchange, *V. piscinalis, P. albus, P. corneus, P. spirorbis, P. glaber, L. truncatula, H. sericea*, &c. Wanted, *H. hortensis*, var. incarnata, and varieties of *H. virgata* and *ericetorum*.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

WANTED, *Isocardia cor*, and *Cardium norvegicum*. Land and freshwater shells given in exchange, many rare.—F. C. Long, 8 Cog Lane, Burnley, Lancs.

WANTED, a few dozen *Argulus foliaceus* (parasite of pike, trout, &c.), in exchange for good slides, and marine specimens in any section.—J. Sinel, Cleveland Road, Jersey.

DUPLICATES.—*L. icarus, P. chi, P. gamma, L. dispar.* Desiderata numerous.—W. Turnbull, 1 Horm Terrace, Viewfourth, Edinburgh.

FINE specimens of foreign shells—helix, mya, clausilia, tellina, venus, cardium, anodon, pecten, bulla, pupa, cyclostoma, haliotis, turbo, nerita, ampullaria, harpa, fusus, cypræa, conus and others, offered for others not in collection; Australian shells wanted. Foreign and Colonial correspondence invited.—Dr. Reed, jun., Ryhope, Sunderland.

WANTED, leaf stick and moss insects, pterochroza, kallima, phyllium, phasmidæ, &c.; trap-door spiders and nests, ant lion (myrmeleon) larvæ. State desiderata.—Mark L. Sykes, New Lane, Winton, near Manchester.

Pl. dilatatus and *Sph. ovale*, from new Lancashire locality, and other land and freshwater shells to exchange. Desiderata numerous.—T. M. Harvard, 41 Union Street, Leyland, near Preston.

OFFERED, cone in cone. Wanted, shells, recent and fossil. Send lists.—J. Smith, Monkredding, Kilwinning.

WANTED, a polished pine tray cabinet, for micro slide. Will give twenty-four well-mounted slides in exchange, including foraminifera, spicules, plant seeds, scales of fish, plants, &c.—George T. Reed, 87 Lordship Road, Stoke Newington, London, N.

EXOTIC butterflies, duplicates: *Pap. sinon, agestor, epycides, paris, vernalis* (new species), *M. adonis*, &c.; also wings of morphos and uranias. Special desiderata, *Pap. ascanius* (Rio), *montrouzieri, dædalus, crino, arjuna*, &c.—Hudson, Railway Terrace, Cross Lane, Manchester.

WANTED, dentalium and entale; will exchange for either marine or land and freshwater shells, also curios and memorial brass rubbings. Will send list. Other eggs than birds' wanted.—Archibald Hy. McBean, S. Denys, Southampton.

Helix arbustorum and *H. hortensis* in exchange for marine shells.—Robert Walton, 44 Canning Street, Burnley.

MICRO mounts in exchange for crystalline rocks or minerals.—J. H. Lewis, F.L.S., 145 Windsor Street, Liverpool.

CONCHOLOGY.—About 400 specimens of *Unio tumidus, U. pictorum*, and *Anodonta cygnea*, and numerous varieties of helices, offered in exchange for antiquarian books or pamphlets relating to Yorkshire, or old Yorkshire newspapers published before 1820.—Geo. Roberts, Lofthouse, Wakefield.

WANTED, *Bythinia leachii, Helix Cantiana*, and *H. cartusiana*, for other land and freshwater shells.—John Radcliffe, 11 Oxford Street, Ashton-under-Lyne, Lancashire.

ORDEAL bark of New Guinea, ordeal beans of Calabar, kava kava, maté, tappa cloth, and henna, in exchange for lepidoptera in any stage.—Tunley, Powerscourt Road, Landport.

EXCHANGE.—Withering's "British Plants," 14th ed., 1877, for any similar work or flora.—B. Prosser, 7 Coronation Road, Bristol.

WANTED, British and foreign ova and pupæ, also foreign correspondence.—H. W. Head, Norwood Street, Scarborough.

UPWARDS of 400 numbers of "Band of Hope Review," in fair condition; would make a good volume, if bound together, of interesting reading. Will exchange for rare foreign stamps: list preferred.—A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.

Solecurtus antiquatus, Thracia pubescens, Solen vagina, Saxicava Norvegica, Phola candida, P. crispata, Pholadidea papyracea, Xylophaga dorsalis, Mya arenaria, Diplodonta rotundata, Pecten glaber (*Tigrinus*), *Pinna rudis, P. pectinata, Pandora inæquivalvis, P. v. obtusa, Lima loscombii, L. subauriculata, Venus chione, V. casina, Donax vittatus*, and *Isocardia cor*, wanted in exchange for fossils, minerals, polished specimens of Devonian corals and sponges, and other British shells.—A. J. R. Sclater, M.C.S., Bank Street, Teignmouth.

SPECIMENS of rocks (150), mostly metamorphic, from eastern Perthshire, collection of nodules from post-glacial clay, and a few old red sandstone fossils, in exchange for modern works on geology.—John Smith, Kirtrench, Meigle, Perthshire.

OFFERED.—"Longman's Magazine" for 1887–8, "English Illustrated Magazine" for 1888, "Welcome" for 1888, all complete; "Walden," "Leaves from a Naturalist's Notebook," by Dr. A. Wilson; "Half-Hours in Green Lanes," by Dr. Taylor; "Electricity and its Uses," by C. E. Munroe; Liassic and other fossils offered for exchange.—John Hawell, Ingleby Greenhow Vicarage, Northallerton.

THE first six parts of "Naturalist's Monthly." Wanted.—British birds' nests and eggs, and British and foreign species of unionidæ.—J. R. Fitzgerald, Clifford House, Harrogate.

WANTED, grasshoppers, locusts, earwigs, cockroaches and crickets (British and European). Offered, lepidoptera, marine, land and freshwater shells, star-fishes, sea-urchins, algæ dragonflies, natural history books and pamphlets, &c.—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, British and European dragonflies, European butterflies, and land shells. Offered, same as above.—W. Harcourt Bath, Ladywood, Birmingham.

CABINET to dispose of, twelve cases, each 24 × 16 × 2 in., with glass, varnished, black knobs, quite new; what offers?—W. Harcourt Bath, Ladywood, Birmingham.

WANTED, a well-set specimen of a hornet (*Vespa crabro*), in good condition, in exchange for good specimens of British land and freshwater shells, or unmounted specimens for microscope, &c.—J. R. P. Masefield, Rosehill, Cheadle, Staffordshire.

BOOKS wanted.—Kingsley's "Town Geology," any of Ruskin's works, "Grevillea," Nos. 2, 4 and 6, or vol. i., 1872, and "Journal of Botany" for April 1888. Will give good exchange in mounted diatoms.—J. B. Bessell, 8 Elmgrove Road, Bristol.

WANTED, to exchange good micro slides for others. Lists exchanged.—Suter, 5 Highweek Road, Tottenham.

WANTED, rare British shells; foreign specimens offered in exchange.—J. T. T. Reed, Ryhope, Sunderland.

LAND and marine shells from Gibraltar and Tangier, and freshwater shells from the Engadine, wanted to exchange for British marine, or any foreign shells not in collection. Lists exchanged.—F. W., Drapers' College, Tottenham.

ENGADINE butterflies offered in exchange for any shells not in collection.—F. W., Drapers' College, Tottenham.

OFFERED.—Howitt's "Book of the Seasons," Ordoyno's "Nottinghamshire Flora," parts 1–33, and Cassell's "Familiar Wild Flowers." Having duplicates of these, I should like to exchange for other natural history works or specimens, especially entomological, or works on angling.—H. Fisher, 26 Stodman Street, Newark, Notts.

WANTED, to exchange British dried plants for North or South American, or Australian. Printed list sent on receipt of address.—H. Fisher, 26 Stodman Street, Newark, Notts.

SCIENCE-GOSSIP for 1885–6 (unbound), complete, in exchange for Wallace's "Canary Book," Green's "Birds I have Kept," and Arnold's "Bird Life in England," or offers.—R. Finn, 2 Archcliffe Road, Dover.

WANTED, perfect and in fair condition, Aaron Penley's "English School of Painting in Water Colours," published by Leighton Brothers, in exchange for good British land and freshwater shells, fossils or plants.—E. R. F., 82 Abbey Street, Faversham.

WANTED, good dissections, well displayed, in either glycerine or spirit, of the reproductive organs, of *Helix pulchella, hispida, fusca* and *revelata*. State desiderata.—W. E. Collinge, 20 Blenheim Place, Leeds.

WANTED, any literature (American, German, &c.), having reference to the darts of the helicidæ; can offer in exchange Flower's "Osteology of the Mammalia," Lyell's "Students' Elements of Geology," Juke's "Geology," "Observations on the genus Unio," by Isaac Lea, with 28 coloured plates, Klein's "Elements of Histology," and eight bound vols. of SCIENCE-GOSSIP, &c.—W. E. Collinge, 20 Blenheim Place, Leeds.

Helix rupestris, showing that this species is ovo-viviparous, with young *in situ*, offered for *Testacellas, S. oblonga, H. obvoluta, V. Moulinsiana, tumida, angustior* or *Acme lineata*.—Edward Collier, 74 Yurburgh Street, Moss Side, Manchester.

Zonites glaber, fulvus, H. aculeata, aspersa, rufescens, sericea, ericetorum, var. *minor, rupestris, lapicida. B. acutus*, var. *bizona, B. perversa, C. rugosa*, var. *dubia, C. tridens, S. vivicola, P. amnicum, A. anatina, P. dilatatus*, &c. &c., offered for *S. ovale, P. roseum, U. margaritifer, B. leachii, L. glutinosa, glabra, Z. radiatulus, nitidus, H. revelata, fusca, pygmæa, B. montanus, P. ringens*, &c. &c., or any named vars. of the commoner species. Send list to—Edward Collier, 74 Yurburgh Street, Moss Side, Manchester.

WANTED, works on geology; palæontology, and mineralogy, also magazines and proceedings, any date, in exchange for micro-rock and mineral sections, &c.—J. G. Dufty, 145 Devonshire Street, Sheffield.

DUPLICATE rock sections. What offers in rocks, fossils or minerals?—J. G. Dufty, 146 Devonshire Street, Sheffield.

OFFERED, fine collections of clausilia and foreign mironidæ; unacceptable offers of exchange not replied.—Miss F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

A GENTLEMAN returning to America has a most perfect black flint arrow-head, found by himself in Utah, U.S.A.; very valuable. Also some beautiful specimens of rich silver ore. What offers or exchange?—E. Cavan-Dance, Glencora, Lorne Park, Bournemouth.

WANTED, *H. hortensis*, and vars. *lilicina* and *subalbida*, also vars. of *H. nemoralis* and *clausilla*. Offered, *Z. alliarius, H. pisana, cartusiana, lapicida, virgata, caperata*, and "Journal of Conchology" for 1878.—Thos. H. Hedworth, Dunston, Gateshead.

EXCHANGE.—3 vols. of SCIENCE-GOSSIP, 1875, 1876, 1887 4 nos. missing; 8 nos. "Monthly Microscopical Journal," 1874; 6 nos. "The Annals and Mag. Natural History," also vol. for 1874, complete, with plates; vol. i. "The Naturalist" (1851), and a few others. Wanted, a youth's portable microscope, microscopical mounting apparatus, photographic outfit, or offers.—James B. Beckett, Trinity Place, Friars Lane, Great Yarmouth.

WHAT offers for a collection of British marine, land and freshwater shells (named), over 70 species.—James B. Beckett, Trinity Place, Friars Lane, Great Yarmouth.

WANTED, micro material in exchange for micro slides.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, *L. involuta*, *P. roseum*, *T. haliotidea*, *S. virescens*, *S. oblonga*, *Z. radiabulus*, *H. pygmæa*, *H. obvoluta*, *B. montanus*, *Vertigoes*, *A. lineata*, in exchange for fossils, shells, &c.—John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton.

WANTED, micro slides. Offered, air-pump with bell glass, also cyclostyle apparatus for printing circulars, lists, &c., both new.—Henry Ebbage, 344 Caledonian Road, London.

EXCHANGE, ½-plate camera, long focus, universal swing, and all the latest improvements, and three double backs; will exchange for piano.—W. Shead, 2 St. Andrew's Road, Higham Hill, Walthamstow.

SLUGS wanted (living) from all parts of the country, in exchange for land and freshwater shells.—F. G. Fenn, Syon Lodge, Isleworth.

BRITISH shells.—Duplicates of over 100 species of land, freshwater and marine for exchange, many uncommon. Lists exchanged.—J. W. Cundall, Carrville, Redland, Bristol.

WANTED, well-mounted botanical and histological micro slides; will give in exchange excellent named specimens of the rarer musci and hepaticæ.—William Smith, 6 Addison Place, Arbroath, N.B.

FOREIGN lepidoptera wanted; British lepidoptera, shells, minerals and fossils offered in exchange. Correspondence invited.—A. H. Shepherd, 70 Brecknock Road, London, N.

WANTED, rock and stock doves (*C. livia* and *ænas*), skins or in flesh. Offered, "Naturalist's World" for 1884–5, two bound vols., nearly new.—J. H. K., 18 Church Street, Commercial Street, E.

WANTED, a good histological microscope, with or without objectives. Give particulars.—Frank L. Tanner, Waterloo Place, Oxford Road, Manchester.

OFFERED, British zoophytes and marine shells. Wanted, zoophytes, land, freshwater and marine shells.—J. Simpson, 51 Lock Street, Aberdeen, N.B.

LEPIDOPTERA, well set and in good condition, also about 1000 duplicate stamps, in exchange for other stamps, in order to increase a collection of 4000 varieties.—H. C. Lilley, Lincoln Road East, Peterborough.

WANTED, Grant Allen "On the Colour of Flowers," second-hand, in fair condition.—Chas. A. Whatmore, Much Marcle, Gloster.

WANTED, pupæ or imagos of American silk-producing bombyces, and other lepidoptera. I shall be pleased to hear from any American entomologist who would be willing to exchange American insects for British.—Robt. Laddiman, Upper Hellesdon, Norwich.

WHAT offers in micro apparatus for any of the following, all quite new: Weismann's "Studies in the Theory of Descent," 2 vols., Martin's "Microscopic Objects Figured and Described," McAlpine's "Life Histories of Plants," Dr. Hamilton's "History of British Fishes," 2 vols., coloured plates, Bowditch's "Suffolk Surnames," Badcock's "Vignettes from Invisible Life."—D. Adamson, 172 Watson Street, Motherwell.

WANTED, a cabinet for micro slides. State requirements. A collection of foraminifera, consisting of over 100 species, selected and named, offered.—A. Earland, 3 Eton Grove, Lee, S.E.

WANTED, any dredgings or shore sands containing foraminifera. Exchange offered in similar material, or in named and mounted specimens. Duplicates offered: *Clavulina parisiensis*, var. *humilis*, *Spiroplecta annectens*, *Lagena lagenoides*, var. *tenuistriata* (British specimens), and many other rarities. Send lists.—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

FOR exchange, micro slides, various objects. Wanted, Hobkirk's "Synopsis of British Mosses," Lowe's "British Grasses," and all books relating to grasses and mosses. Also John's "Forest Trees of Britain;" micro slides in exchange.—Ernest O. Meyers, Richmond House, Hounslow, W.

WANTED, gramineæ, musci, and micro fungi from all parts of Britain, in exchange for micro slides.—Ernest O. Meyers, Richmond House, Hounslow, W.

FOR exchange, a small collection of British land and freshwater shells, many rare, also British and foreign marine shells. Wanted, natural history books, micro slides, material and plants.—Ernest O. Meyers, Richmond House, Hounslow, W.

SCIENCE-GOSSIP, vols. 4–11, inclusive, wanted; will give liberal exchange in slides, illustrating most branches of microscopy.—Fred. Lee Carter, Gosforth, Newcastle-on-Tyne.

MOUNTED or unmounted parasites wanted, in exchange for others, or general slides.—Fred. Lee Carter, Gosforth, Newcastle-on-Tyne.

FOREIGN correspondents wanted to exchange mic o slides or material.—Fred. Lee Carter, Gosforth, Newcastle-on-Tyne.

WILL harden and cut the tissues, and send well-mounted slides in return, for physicians' and surgeons' own pathological material. Correspondence invited.—Fred. Lee Carter, Gosforth, Newcastle-on-Tyne.

OFFERED, "The British Herbal," by Rich. Culpepper, and "Gen. Student in Physic and Astrology," 2 vols., with many coloured plates of plants. Wanted, Woodward's "Geology of England and Wales," 2nd edition.—J. Smith, Monkredding, Kilwinning.

OFFERED, carboniferous limestone fossils for others, or for marine shells.—F. C. King, Bank Villa, Fulwood, Preston.

WANTED, good British and foreign zoophytes; must be correctly named, also marine algæ; good exchange in mounted or unmounted material, micro material, or micro apparatus. State wants and list of above, also what quantity can be supplied.—R. M., 24 Park Road, Clapham, S.W.

WANTED, ⅛th or ⅙th object glass for microscope, good definition and universal screw, in exchange for sixty-seven species of dried plants collected by the owner on the steppes of Russia, south of Moscow.—G. E. Gavey, 7 Westbourne Villas, West Brighton, Sussex.

RARE butterflies and moths wanted in exchange for good opera-glass.—John J. Holstead, 19 Millholme Terrace, Upperby Road, Carlisle.

WHAT offers for the following books? P. H. Gosse's "Year at the Shore" (a leaf replaced by a sheet of note-paper), Lindley's "School Botany," and "Notes on Collecting and Preserving Natural History Objects," by J. E. Taylor and others, slightly soiled.—J. W. B. Rodgers, c.o. Green and Lloyd's, Cadman Lane, Norfolk Street, Sheffield.

A GOOD duplicate (nearly complete) of British mosses offered in exchange for foreign mosses, hepaticæ or algæ especially wanted. Marine algæ, named or not, from any part of the world, or exchange of specimens of these plants. Collectors having any of these to dispose of are requested to write for particulars to—J. Miles, Sudely Place, Kemp Town, Brighton.

Cl. laminata, *C. itala*, *C. lineolata*, *C. parvula*, *C. plicatula*, *Cyc. elegans*, *H. caperata*, *Cl. Rolphii*, *D. polymorpha*, and *L. peregra*, *L. stagnalis*, and *Anodonta cygnea*, and *Anatina*, from numerous localities, in exchange for *Sph. ovale*, *L. involuta*, *L. glutinosa*, *U. tumidus*, *T. haliotidea*, or *Vertigoes*.—F. R. Fitzgerald.

Helix aspersa, *nemoralis* and *hortensis*, in exchange for the same species from other localities.—F. R. Fitzgerald.

BOOKS, ETC., RECEIVED.

"Fossils of the British Islands," vol. 1, Palæozoic, by Robt. Etheridge, F.R.S., &c. (Oxford: Clarendon Press).—"Invisible Powers in Nature," by E. M. Caillard (London: John Murray).—"Planetary and Stellar Studies," by J. E. Gore (London: Roper & Drowley).—"Entomology for Beginners," by Dr. A. S. Packard (New York: Holt & Co.).—"Primer of Micro-Petrology," by W. Mawer (London: 4 Essex Street, Strand).—"Class-Book of Elementary Chemistry," by W. W. Fisher (Oxford: Clarendon Press).—"Practical Geometry," by John Carroll (London: Burns & Oates).—"Illustrated Manual of British Birds," Parts 4–7.—"Book Chat."—"The Amateur Photographer."—"The Garner."—"The Naturalist."—"The Botanical Gazette."—"Journal of the New York Microscopical Society."—"Belgravia."—"The Gentleman's Magazine."—"American Monthly Microscopical Journal."—"The Essex Naturalist."—"The Midland Naturalist."—"Feuilles des Jeunes Naturalistes."—"The American Naturalist."—"Journal of Microscopy and Nat. Science."—"*Ottawa Naturalist.*"—"Scientific News."—"Wesley Naturalist."—"Report of Botanical Exchange Club for 1887."—"Tyneside Review."—"Proceedings of Norwich Science-Gossip Club."—"Address by Dr. C. C. Abbott on Anthropology."—"Trans. Dumfriesshire Nat. Hist. and Antiquarian Soc.," &c. &c.

COMMUNICATIONS RECEIVED UP TO THE 13TH ULT. FROM: G. F.—F. C. L.—C. P.—A. E. W.—J. T. T. R.—J. K.—J. S.—M. L. S.—W. T.—W. A. G.—D. W. B.—J. W.—T. S. M.—L. W. L.—J. H.—W. J. F.—W. H.—A. R. O. S. G.—J. W. O.—T. D. A. C.—J. A. W.—F. G. F.—S. H.—G. D.—J. W.—W. H. H.—B. T.—J. C.—W. P.—J. M. H.—H. McB.—J. S.—A. J. O.—F. A. N. B.—J. E.—W. P. H.—A. S.—G. T. R.—F. P. P.—A. J. H. C.—F. W.—F. C. L.—Dr. J. W. W.—R. W.—H. W. M.—C. J. S. B.—W. E. C.—J. W. W.—J. B. B.—E. C.—R. S.—R. F.—J. T. T. R.—E. R. F.—W. H. B.—H. F.—F. W. P.—W. H. T.—A. J. R. S.—A. E. M. J. M. C.—H. W. H.—D. B.—K. E. S.—W. G. W.—J. S.—J. R. B. M.—E. B.—J. R. F.—N. L.—J. W. O.—T. O. A. C.—F. G. F.—J. A. W.—A. N. O. S. G.—W. T. B.—N. H.—F. G.—W. I. F.—R. C.—J. G.—F. L. C.—W. S. J. S.—J. H. K.—C. A. W.—D. A.—A. E.—A. H. S.—J. H. A. V.—W. M.—R. L.—F. L. T.—H. C. L.—J. G. D.—J. T. M.—H. E.—F. M. H.—E. C. D.—T. H. H.—J. B. B.—J. H.—E. O. M.—R. W. H.—G. K. G.—W. S.—F. G. F.—C. J. S.—J. W. C.—G. E. G.—J. M.—H. A. F.—R. M.—J. J. H.—J. W. B. R.—F. C. K.—W. H.—W. J. S., &c. &c.

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