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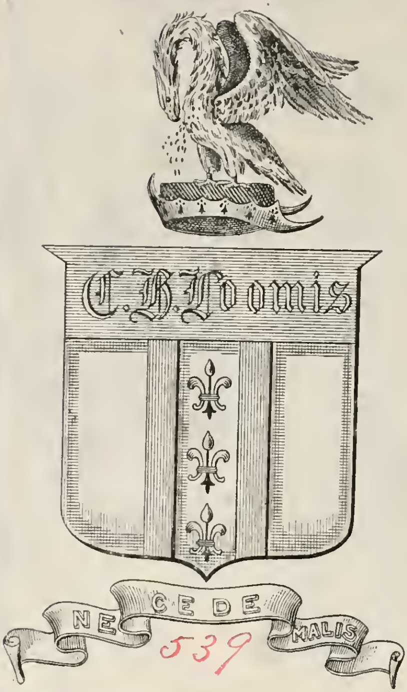
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HARDWICKE'S

SCIENCE-GOSSIP:

1891.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

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PREFACE.

ANOTHER swing of the Pendulum of Life! Only three-score years and ten—not that, according to the statistics of the Registrar-General, if we take the average life of the humanity introduced upon our planet. One feels inclined to modify the well-known lines of the Latin Poet, popularly set forth by Longfellow, about Art being long, and Life being fleeting. Instead of Art, read *Science.* Art was evolved to please people—Science to instruct them. Art has played to the most foolish, most extravagant, most lascivious peoples of the world. Art is glorious: it is the Revelation of genius. But Science is Democratic—it is the possession of all. Men like Robert Dick of Thurso, and Thomas Edwards, are the apostles of this new democratic possession of a scientific intellectual power which is neither aristocratic nor oligarchic, but which belongs to the "Commonweal."

This is the present Editor's "coming of age." For twenty-one years he has enjoyed the delightful responsibility of addressing and interesting thousands (perhaps scores of thousands) of readers of SCIENCE-GOSSIP every month. The responsibility is great—greater than few are aware of. The correspondence entailed is enormous; so the Editor has to appeal to the Christian patience of his readers. He is always open to receive any suggestions from readers that will influence the commercial success of his journal—a success the Editor would derive no advantage from, but which he would be delighted to see the Publishers thereof should, if only as an expression of their generous and trusting confidence in himself.

PREFACE.

The Editor would point out that this annual volume is distinguished even above its predecessors by original papers. Those on the British Diptera and Rhizopods alone will hereafter make the Volume for 1891 sought after. In addition, he desires to draw attention to the articles on the new aspects of Darwinism, &c., to show how much SCIENCE-GOSSIP endeavours to keep pace with the Philosophy as well as with the facts of Modern Natural Science.

The Editor is fortunate in being surrounded by a zealous *clientèle* of earnest contributors, to each of whom he owes much. The low price of the Old Monthly does not bring a fortune, but it helps SCIENCE-GOSSIP to brighten the home of many a working-man naturalist; and there is no better tribute to the eagerness to receive its monthly issue, than the grumbling letters sent when the magazine appears a day or two later than usual.

For twenty-seven years SCIENCE-GOSSIP has held the privilege of being the chief and most largely-circulated popular scientific magazine in Great Britain—which means in all the world! There is no better testimony to the growing love of and interest in Nature, than that such a magazine should continue to be so much required.

No effort in the Future will be spared to keep up the well-earned reputation of the Past. Notwithstanding the fact that so many paths have been well trodden, there still remain fresh fields and pastures new. Natural Science, like Astronomy, may be explored, but cannot be exhausted.

With warmest Christmas greetings, and best Seasonal wishes, the Editor is thankful once more to greet old friends with an invisible hand-shake, and wish them, one and all,

A HAPPY NEW YEAR.

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GREGARIOUS SPIDERS.

By G. Cadogan-Masterman, M.D.

THE story of the bird-slaying spider is so nearly apocryphal that it has all the fascination of the untrue for the popular taste; so, it is almost a pity to spoil the gruesome legend of Madame Merian by the admission that, although the gigantic Mygale does secure sleeping or wounded birds occasionally, they are usually humming birds not half its own size, and they are none of its own trapping, since it does not form a web. This may not be true of every variety, but the spinnerets of all I examined were of quite rudimentary development. And I have seen it come down with so obviously an unintentional and most disconcerted flop on the floor of my quarters that even the almost universal suspensory line was evidently beyond its textile capabilities, or, at least, out of its line of business.

I have sometimes thought that this horrible creature was the avenging Fate of other spiders: that when they became too horribly bloated, too sated with lustful slaughter, it crept upon them in the darksome but never silent night, a living incubus, a hairy, formless horror, and with one stab of its poison fangs recalled the dying agony of an insect hecatomb.

But the still stranger and yet most true story of the gregarious spider of Paraguay is almost unknown. I am far away now from books of reference which might confound me, but I am under the impression that I told it myself for the first time in England in 1869. The strangeness of it is this: Spiders are the most solitary of assassins, and, were it not for the anatomist, we might believe that they were created without hearts or bowels, for, even the tender passion softens but for a few fleeting moments the cold-blooded ferocity of their lives; many an ardent but too tempting lover amongst them has been at one minute the bridegroom and at the next himself the marriage feast!

I have watched such a swain crouching motionless at the edge of a web for an hour, yet ever ready for a backward spring, stilling—we may imagine—the beating of his vesicular heart lest it should vibrate the threads too aggravatingly, and casting from six to eight sheep's eyes at the velvet-robed damsel within. She, meanwhile, as watchful, almost as motionless, only meditatively twiddling her palpi as she wonders if she love him enough to eat him. And, alas, the next morning I have found his shrivelled remains still in the old spot, but wrapped in the newest of silk and his inamorata the most buxom of Artemisias.

Reaumur hoped to cultivate spider silk: he fed his spinners and spinsters right royally; he sang to them *chansons d'amour*, but nothing could subdue their longing for arachnidian "long pig"; the big spiders ate the little ones, and then, with unabated appetite, tried to eat each other. A pair of stockings, it is said, was woven from the silk, but I believe are as mythical as the web of Penelope.

Imagine, then, the astonishment with which I saw with my own eyes thousands of large spiders living, working, peacefully feasting together in webs as big as a large table-cloth!

It was on the broad sandy road from the capital to La Trinidad that I met with the first example, and, although it had been much torn by the wind, it was large enough to puzzle me as to its nature. The road is about forty feet wide—road-making in that part of the world means simply clearing a certain space of the few trees likely to be in the way and leaving the ground as Nature made it—the palm trunk to which the web was attached at one end stood just within the rough boundary railings, an old mahogany tree stretched its gnarled branches over half the other side for the further moorings, so, about twenty-five feet was its length, its depth six, and it was so far overhead that I could just touch its lower edge with my whip as I rode beneath. Being near mid-day it was untenanted, but the threads were littered with moth-wings and other remains of insects, but I noticed that small birds flew through it without hesitation.

From time to time I saw other examples, some larger than the first, but there was ever one point not a little mysterious about them ; I had noted in the evening, perhaps, a perfect web crowded with the busy workers ; the next day not a trace of it was to be seen ! There may have been wind, but in any case one would have expected that some part of its delicate tracery would have been found clinging to the trees ; but no—web, spiders, and all had disappeared into the unknown, and it was long before I could trace what had become of them.

During the blockade of Asuncion, however, by the Brazilians, I had a better opportunity than I could have hoped for to study the economy of these strange colonies. I was then living with the United States minister in a very large house, having, as is the fashion in that part of the world, an enclosed garden, the patio, in its centre ; and there I found to my delight six of these wonderful webs one morning. And with that sublime reasoning we call instinct they were all close to the ground, were moored to it, in fact, by a hundred hawsers. Over the roads they were never less than twelve feet from the ground and, so, must have missed numbers of moths which fly lower, but, then, they permitted horsemen and the high bullock-carts to pass freely beneath.

But this rather forlorn garden was rarely entered except by myself and a stooping crone, the mother of one of the native servants, the usual path was under the shade of the massive piazzas which enclosed it ; so the spiders and I examined each other at our mutual leisure and convenience. But they seemed to take very little notice of me, and a double stream would be passing up and down the main cables within three inches of my hand-glass with untroubled indifference.

The spiders seem to belong to the Epeira, but are twice as large as our largest specimens ; black, with the exception of a double row of scarlet spots on the sides of the oval abdomen, four eyes (says the imperfect note amongst my rifled papers), but I think it should be, four at the top of the head (cephalo-thorax) ; two lateral, very strong mandibles, and eight stout, smooth legs nearly an inch in length.

In the centre of the patio was a clump of orange and peach trees—which there reach quite forest size—and others at a distance of some forty feet : between these the webs were extended, the majority in the usual horizontal position, but one obliquely, a rhomboid, with one angle touching the ground. The main rigging was of stout grey silk, as strong as that with which purses used to be netted, these were crossed at right angles by threads more slender, dividing the surface into squares of about nine inches each, which were filled by a geometrical weblet resembling that spun by our own garden spiders. These did not seem to be regarded as personal property, for the occupants often changed their location, and a double stream was ever passing, as I have said, along the main lines, crawling over or under each other, and never pausing as ants do when they meet for gossip or petty larceny ; but I noticed that the occupant of the centre of the lesser webs would give it a quick, impatient shake whenever a companion ventured to leave the public gangways : yet I have seen three or four feeding amicably together on the body of a large moth.

As soon as the sun became hot the webs were quite deserted, and the spiders collected in globular masses under the shade of the leaves of the orange trees until evening. But at sunset these crumbled to pieces and the spiders in the most leisurely way dispersed to their aerial fishing grounds. Great numbers of mosquitoes and other minute insects were caught, but these were brushed away ; moths, beetles, and migrating ants—which are temporarily provided with wings—being the chief and most valued prey. I satisfied myself, too, that they did not merely suck their juices as our spiders do, but ate the whole of the soft parts, which their strong maxillæ made easy enough. I many times let them strike their fangs into my finger, but felt no pain beyond the slight prick of the keen points.

But the oddest trait was that they ate any part of the web which had been torn loose ; the nearest spider rolled it up into a ball, moistened it with saliva, and immediately swallowed it. And that explains what becomes of part, if not all, of the old ones.

I was long puzzled by the difficulty, how was the first thread thrown from tree to tree? The spiders were far too solid to float through the air, and as for fastening the line to a branch, descending the trunk, ascending another and dragging the line after them, as the natives assured me they did, that was clearly impossible. But one evening I was fortunate enough to see it done. There was an iron arch over the mouth of the *algibe*—the Moorish tank—in the patio and at its summit I saw a spider busily weaving a light tangled ball of silk as large as itself, a current of air caught it and it floated away nearly to the top of a tree ten yards away and caught, the spider gave it two or three tugs to be sure of it, and then with the utmost nonchalance crawled away to a height which would be to us as that of St. Paul's, soon came back, was joined by some companions and in less than an hour the bridge was made, and a new web commenced.

THE DAISY'S PEDIGREE.

By A. H. Swinton.

"TWO or three years ago," says Mr. Grant Allen, in the August number of the "Cornhill," for the year 1881, "lying in the sunshine on this self-same tangled undercliff, I dissected a daisy for the benefit of those readers who were good enough to favour me with their kind attention. But that was a purely æsthetic dissection, for the sake of discovering what elements of beauty the daisy had got, and why they pleasurably affected our own senses or appealed with power to our higher emotions. To-day, however, I propose to dissect one of these daisies a little more physically and unravel, if I can, the tangled skein of causes which has given it its present shape and size, and colour and arrangement." A very simple and logical explanation of the natural order of things our acquaintance now proffers in respect to this well-favoured flower on the enchanted precincts of the quiet undercliff, and if lineaments mean aught, then he has most infallibly unfolded its shadowy pedigree. "For," he urges in conclusion, "if we follow down the daisies' descent in the inverse order we shall see that, inasmuch as they have coloured rays, they are superior to all rayless composites; and inasmuch as composites generally have clustered heads, they are superior to all other flowers with separate tubular corollas; while these, again, are superior to those with separate petals; and all petalled flowers are superior to all petalless kinds."

"But," it will be slyly asked by our academic acquaintance, whom we are accustomed to greet of a shiny morning on this self-same landslip, "you are never going to convince me that a fir-tree gave birth to a rose-bush, a rose-bush gave birth to a heather clump, a heather clump gave birth to a waste of eupatory, a waste of eupatory gave birth to a sunflower, and a sunflower gave birth to a daisy." Well, no, not precisely; but to teach the infantile mind we present ideal pictures, confessedly inexact, and it is often possible thus to substantiate that which we cannot demonstrate; and to connive at this same let us leave our sentimental nook for the dutiful arena of golf. We have had a cold unproductive season devoid of novelty, say the insect-hunters, and strolling along the craggy shore, when the fires are on in July, as numb as any crab, say, what if we should come upon a pallid, decrepit daisy, with the florets of the disk few, and some of them white and arrested in the very process of turning into those of the ray, just as a sea-anemone would appear were it petrified when in the act of extending its feelers; so that this blossom would thus actually exhibit to our gaze the last two stages of development thought out by the anatomist. Well, everything, it is said, varies on the confines of its possible existence in its present shape, and one is here tempted to enquire what changing forces have acted on since the golden morning of the daisy-flower, and whose are the viewless fingers that have drawn and pinched out a smart frill around its crown of honeycomb? Nay and what cuts a flag into streamers and spins out a plant into branches and leaves, if it be not the force of the tossing winds and rocking tides? The Jubilee florin falls impressed from the mint, but only think how any daisy crown must have been scourged by the north wind, fluttered by the east wind, breathed upon by the south wind, and kissed by the west wind; and how its fibres variously struck must have vibrated to all the harmony of heaven and composed atomic music until the sun's image was fairly expressed; but let this pass for a more certain fact, since a glance will show the unfinished flower as we plucked it upon the cliff in question, in the very act of unbinding its golden tresses.

Allowing, next, the daisy head to be an example of fasciation, coming true from seed; the latter circumstance being alone curious, since fasciation is far too frequent and identical in the vegetable kingdom to be termed a monstrosity, for only think of the cauliflowers and cockscombs, and all the wilding growths of this description never destined to become species, already chronicled in SCIENCE-GOSSIP; we hear it likewise asserted that all flowers with separate tubular corollas are superior to those with separate petals. Well, as I recall, on the 17th of September, 1883, as I chanced to be walking along a dark Surrey lane in the neighbourhood of the Green Man tavern, at Worplesdon, I noticed in the bramble-overrun hedgerow the curiously fingered blossom of the Large White Convolvulus (*C. sepium*, Linn.) now represented by a specimen, which shows how such a bell-shaped flower may revert to a petalate one by dividing down between the veins. Whether the ancestral blooms wore this eccentric passion-flower likeness on this creeper I cannot think, albeit the convolvulus structure assigns to it these five petals; or how these same petals became a white poke, as children call it, I will not say, though this be by some reckoned to have been a freak of nature for which the insects are responsible; and without a doubt insects always enjoy to dive to the bottom of it. Thus much will, however, serve to indicate that not alone have we "still several fish in the very act of changing into amphibians left in a few muddy tropical streams; and several oviparous creatures in the very act of changing into mammals left us in the isolated continent of Australia;" but that we also possess in our own lanes and fields, flowers crystallized in the very act of their metamorphosis; so that not tacitly has evolution "almost always left its footmarks behind it, visibly imprinted upon the earth through all its ages;" but the continuous operation of this law likewise leaves behind it its tags and ends as it weaves the woof and warp of fate. Now it is just the recognition of these tags and ends that is wanting to establish the really clever problematical reasoning of Mr. Grant Allen in regard to the daisy's pedigree, as I have little doubt; and if the reader is of my mind, he will acknowledge that the Editor of SCIENCE-GOSSIP in advocating the recognition here of law in place of the byword of monstrosity, applied invariably to that which we do not understand, has thereby cast a flood of light on the past history of the flowers.

There remains a little finishing touch of purple on the flowerets of the daisy resembling the mark of a copying ink pencil, that is apt to attract notice. Were a Grinling Gibbons set to carve a flower-head, it is probable that he would turn it on the wheel, and had he afterwards to colour it he would ask but for few pigments, for robbed of compound hues, pattern and half-tones, the floral colours can be readily suggested, and in point of fact fully-coloured flowers such as dahlias and roses undeniably match well. Perhaps one of the most surprising things to meet with anywhere on this score is a field of roses, where velvety full-coloured blossoms, red, purple, and yellow, spring side by side from the wreck of the things that were; and curiously enough there may be sublimed from the said black mould peacock hues that will surpass the roses themselves in lustre. I allude to the prismatic hues of aniline, first discovered in 1826 by Unverdorben in the products of the dry distillation of indigo, and in 1834, proved by Range to be a constituent of coal tar; and which like aluminium, must be reputed one of the commonest things in the world. Though I have not hitherto obtained great results from staining flower bulbs with prepared aniline dyes, I might yet hint that some of the shale hills that diversify the black country, containing as they do so much of the innocuous raw material, might if ground to powder and mixed with sewage or otherwise, work marvels on the parterres; for after walking some weary miles over them, I can only aver that grass grows on them luxuriantly and ragweed flowers prodigiously, nor will I ever say that it was not a trifle more golden in the sun. Indeed at the present the history of our surprise garden blooms is proverbially far too much of a mystery and too little of a science; for all I could elicit from a professor regarding his educated favourites was, that they were obtained by crossing, but when and where escaped him.

FEW people in England have the slightest idea of the high value attached to scientific education in all the Australian colonies. We have just received a "Prospectus of the Stawell School of Mines, Art, Industry, and Science." This is a well-known Victorian mining town—whose population is not yet commensurate with its public spirit. Whilst we are talking about adopting a Technical Education Act, they are adopting one of their own.

NOTE ON A FOOT-WORKING BLOWPIPE.

By H. DURRANT.

AMONG the portion of our working mineralogists there are those who have often felt the want of some method to produce the necessary stream of air for the fusing of the different substances, so as to do away with the blowing through the mouth.

I propose in this short paper to give instructions for making one, which, though rough and simple, is very efficient, which after all is the great desideratum. First of all then, an old square table is wanted, mine is an old machine-stand, which serves the purpose admirably, being very firm; if you have not got a spare table, you can easily make one, providing you do not wish "a thing of beauty," instead of a working machine; if so, get a carpenter to make the table for you, and so combine the two qualities; though after all it will not be an ornament for the drawing-room. Supposing you have your stand ready, the next thing you will want is a good strong pair of workshop bellows. About four or five inches from the floor, fasten a shelf under the table. Six inches higher fasten a similar shelf. Now take your bellows, lay them lengthwise along the lowest shelf, so that the handles will project beyond the side of the table.

Fasten them in their place; first by a screw through the lower handle into the shelf, and next by a piece of sheet-iron over the nozzle, fasten each side by a screw. Next take a piece of wood, the same width as the handle of the bellows, let it project about three inches over the top bellows-handle; fasten in place by a couple of screws. Underneath it drive a staple; ditto on top. You will want now about a yard and a half of rubber tubing.

If the tubing was now fastened to the nozzle of the bellows, and the other end to the blowpipe, you would not, by working the bellows, be able to obtain a continuous stream of air, which is what we want; so we must make an air-chamber, to contain a supply of air while the bellows are being refilled.

For this purpose make a rectangular box about six inches by two and a half. Before nailing the sides up, a piece of thin cloth should be inserted between the joints, to make it air-tight.

The bottom of the box (one of the smaller ends). will have to have a round hole cut in, and a little clack fastened over it, to prevent air from rushing back into bellows when pressure is released.

A hole must also be cut in the top and another in one of the sides. Now get a piece of copper or brass tubing to fit tightly into rubber tubing; fix one end of your rubber tubing tightly round nozzle of bellows, bend the piping round, so that it will come under second shelf, in which a corresponding hole with the one in bottom of box should be cut. Nail your box on over this hole, tightly to the shelf. Now to make the tube fit air-tight, you must get a cork, cut a hole through with a sharp knife, making it just a shade smaller than copper tube, fix the cork in the hole of the box underneath, and push in the copper tube, which should be attached to the rubber-tubing. Do the same by the hole in the top of box, inserting cork and copper tube as before, to which must be fastened another piece of rubber tubing, carrying it up under the table, and bringing it through a hole in the front of the table, a little way.

Fix your blowpipe in this tube, inserting a cork if not fitting tightly enough.

The blowpipe can now be made firm by fastening an upright of wood on the top of the table, and fastening the blowpipe to it by bending wire nails round. We have now a hole left in the side of the box.

Now what we want is a bag to contain the supply of air necessary to keep the blow-pipe in full swing. When you can obtain a nice continuous stream of air, proceed as follows:

Obtain a spiral spring and fit between handles of bellows. Or to the staple tie a piece of cord, bring it to the top of the table, pass it over a small pulley, and attach a heavy weight. Now for the pedal; to the staple on under side of handle of bellows attach another piece of cord and fasten it to the end of a strip of wood, broad enough to place the foot on. You will now find that after you have pressed this with your right foot, on the pressure being relaxed, the bellows will be expanded by the weight attached to the cord.

Of course they are thus filled with air. It will be rather awkward at first to continue the pedalling, but you will soon get used to it, and once you get the bladder filled, a steady continuous motion keeps a nice flame. You can, if you like, weight the

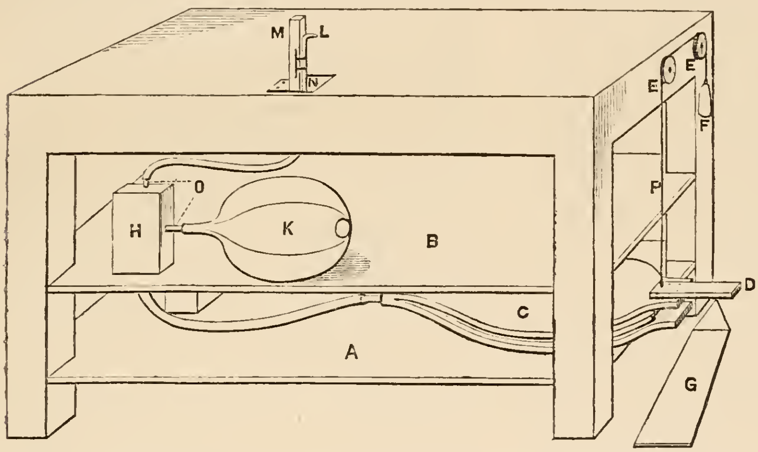

Fig. 1.—Foot-working Blow-pipe. A, bottom shelf; B, top shelf; C, bellows; D, strip of wood nailed on handle of bellows; EE, pulley wheels; F, weight; G, pedal for foot; H, air chamber; K, football bladder; L, blow-pipe; M, upright of wood; N, hole in table; OO, copper tubing; P, cord.

Fig. 2.—A, Cork; B, Copper tube; C, India-rubber tube.

The bag to produce this must of course collapse by its own elasticity or by weights judiciously placed.

The best and most easily obtainable is a common football bladder. Fix the nozzle over a copper tube and cork it in as you did the other tubes, allowing room for the bladder to expand without coming in contact with sides of box.

You will now find, if you have followed instructions, that if you blow the bellows with your hand, the bladder will fill; once filled, a steady motion with the bellows, never jerky, will keep a constant stream of air issuing from the blowpipe; when the blowing is stopped, a stream of air will continue to flow from pipe till the bladder is exhausted.

If the bladder soon collapses after the blowing is stopped, the wind is escaping somewhere other than through the nozzle of blowpipe. Light a candle and go all round joints, &c., and you will soon find out where. Remedy: stop up with putty or pitch, and do not use the machine again till thoroughly set.

bladder, by tying weights at each end of a cloth, and arranging it nicely over the bladder. This will give you a stronger blast of air, but the pedalling will be much harder, because the bladder empties much more quickly, and also takes more pressure to keep it filled.

I think there is nothing more to say now. Its use being too well known by mineralogists, &c., except that with care, a flame eight or nine inches long is easily obtainable with a wax candle. All kinds of glass-ware for naturalists can be made with a very small amount of trouble, such as dipping-tubes, test-tubes, capillary-tubes, tubes for collecting small insects, &c., funnels, and a host of other similar articles, of which I hope to say further in another paper if the Editor can spare me space.

As it is I am afraid I have taken up too much room already, but if any one not quite seeing principle, will write to me (address with Editor), enclosing stamped envelope for reply, I will give further information.

PECULIARITIES IN SITE AND STRUCTURE OF BIRDS' NESTS.

A GOOD many years ago I contributed a short paper to SCIENCE-GOSSIP,* bearing the above title, the few instances therein cited being culled from my natural history diaries; and now, since peculiarities in the form, size, and coloration of birds' eggs are being freely adduced and discussed, perhaps a few additional instances of those of site and structure of their nests may not be out of place.

Great titmouse, or oxeye (*Parus major*).—On June 10th, 1884, I discovered in St. John's Cemetery, Elswick, a nest of this handsome bird, containing callow young, which had been built within one of the numerous fire-clay pipes used for marking out sections of the burial ground. This pipe is pentagonal in form, is open at the bottom, and has a sloping top or roof upon which is impressed a capital letter; it has a depth of 16 inches at the back, and 12 inches at the front, the roof sloping from back to front; and in the centre line of each side, that joins the front at right angles, is a circular hole 1·75 inch in diameter whose centre is 5 inches distant from the open bottom, and in the front or face is a similar hole whose centre is 8 inches from the bottom: the front is 5 inches wide, and these two sides are each 3 inches wide, whilst the remaining two sides, which meet in an acute angle at the back of the pipe, are 3·5 inches wide; the width, or diameter, from front to back being 6 inches. The pipe had been sunk into the grass-and-herbage-covered ground until the lower edge of the front and higher hole was level with the surface, whilst the two lower lateral holes were of course buried beneath it. The bulky nest, which consisted of moss, cow and horse hair, sheep's wool and rabbit down, was beneath the level of the lateral holes, and was reached by the front hole which was the sole point of ingress and egress. On several occasions I sat near by and watched the parent birds bringing abundant food for their young. They frequently, though not invariably, first alighted in a young elm-tree which overhung the home of their progeny, flew thence to the top of the sunk pipe, and thence to the hole of entrance, though not infrequently the female flew direct to the hole without alighting elsewhere; the moment the parent bird had alighted on the roof of their home, the young ones gave utterance to their expectant cries. The food, which was assiduously catered for by both the male and the female, consisted chiefly, if not entirely, of caterpillars; and on one occasion on which I timed their visits, within ten minutes each bird had brought food three times, notwithstanding that they were aware of and startled by my proximity, and thereby prevented from their normal procedure.

* Vol. ix., p. 203.

Common, or "Kitty" wren (*Troglodytes parvulus*).—Who of us, as nest-hunting schoolboys even, have not become acquainted with the more or less unfinished, so-called "cock-nests" of this familiar and favourite little bird, more than one of which might sometimes be found built in the same hedge-bank not far distant from the true, or breeding nest, and at that time devoutly believed to have been built by the cock bird for the purpose of roosting in at night. The "cock-sit" (cock's-scat), too, which we generally managed to make out in the bankside, near by the nest of the "yowley," or yellow-hammer (*Emberiza citrinella*), was also considered to be the roosting place of the male or cock bird, it being taken for granted, I assume, that the hen bird alone occupied the nest, and that the cock would not be or ought not to be very far distant from his mate. Possibly, however, it may be news to many readers of SCIENCE-GOSSIP to learn that these cock-nests, as well as the true nests, of the wren may occasionally be obtained at the expense of another familiar and favourite bird—the swallow; three instances of which have fallen under my observation, all in one season, and at no great distance apart. The first instance was on June 9th, 1885, when I had my attention drawn to the circumstance of a wren carrying up materials to a swallow's nest built in the roof of a high wooden hayshed or stack-cover; and, on watching a while, I observed the wren carry up a billful of dry grass, enter the nest, deposit its cargo, and then depart, softly singing part of the time: hence, I concluded that it was the male bird who was thus spending a part of his superfluous energy on the construction of a cock-nest, whilst his partner was engaged in the arduous task of incubation somewhere near; for the wren had here been for some time past in full and vigorous song, occasionally, too, singing on the wing as he passed from one elevated perch to another. On a cursory examination of the nest of the swallow, it was found to be quite new—of the present season—to be complete in the shell and apparently ready for its lining of soft materials; and that the birds had not yet forsaken it, but flew into and around the shed, notwithstanding that the wren was engaged in building a top or dome of dry grass and moss to it. Not until July 18th, however, when the hay was being stacked under this shed, and the usurped nest could be reached from the top of the stack, was it disturbed; though for some time past it had obviously been forsaken by the rightful owners, the swallows, and was as obviously not being used as a breeding-nest by the usurping wren. On being taken down from its site, it was found to be a large fine and evidently completed shell, ready for its lining of dry grass or hay and feathers, etc.; and that the superimposed nest of the wren was of the usual domed character, and composed of fine dry grass outwardly, and moss with a little sheep's wool and a few feathers inwardly, whilst that portion of the nest below its side entrance descended into the mud nest of the swallow.

The second nest of a swallow usurpėd by the wren I found built against one of the beams supporting the ceiling of one of a group of deserted thatched cottages which were being allowed to fall into decay, the sashes having been removed from the windows and thus allowing a free ingress to the birds, which privilege the swallows had freely availed themselves of, as many of their nests were to be found within. This, too, was a nest of the season, complete in the shell, the top of which was within a couple of inches of the ceiling; and it had evidently been having its lining of hay and feathers put in by its rightful owners when it had been unsurped by the wren, whose domed nest (consisting of moss chiefly) had been, as in the former case, built within the open nest of the swallow, the dome being carried up to the ceiling. As the date on which this compound nest was found was so late as July 7th, it is not improbable that this, too, was a cock-nest of the wren, and had been completed for some time before its discovery. In the third instance, the wrens reared a brood in the nest of the swallow which they had usurped, or at least utilised, in the roof of an outbuilding not a quarter of a mile distant from the second nest recorded, and certainly not more than a half mile from the site of the first, the site of the second being intermediate: this third nest, however, of which I had intimation, I failed to get to see; but I have no doubt whatever of the accuracy of the account given me of it, though it is not impossible that it may have been an old and deserted nest of the swallow which the wrens had simply utilised as a foundation upon which to erect their own edifice.

With respect to the spare or cock nests of the wren, the question arises, For what purpose are they built? Are they really built by the male bird alone, as a shelter for himself during the nesting season and possibly later on in the year? Or, are they built by him simply because he is so full of life and vigour that he must be busy, at a season when there is a superabundance of food and the numerous young have not yet been hatched to give both himself and partner labour sufficient in catering for their appetites? Or, is it possible that they are built by him prospectively for the accommodation of a second brood after the first have been got off, and subject to the approval of *mater?* This, perhaps, would account for their being discarded as unsuitable in site or structure, and another nest more in accordance with her tastes or requirements constructed. That this extra nest is, sometimes at least, used by the wren as a place of shelter at night towards the close of the year, I have had proof of; since I have visited one such nest with a lantern almost every night in the latter half of October between the hours of nine and ten, and almost invariably found a wren snugly ensconced within, and obviously much taken aback at having a bright light shone full in upon it from the small rounded entrance in the front of its very comfortable chamber.

Pied wagtail (*Motacilla lugubris*).—I have seen a nest of this bird which had been built in an old nest of the swallow, up in the roof of a "hemmel" (as the open-fronted outbuildings for the retreat of the grazing sheep and cattle are termed in the pastoral districts of Northumberland); and it was composed of an abundance of sheep's wool and hair, with a little dry grass and a few fibrous roots, the whole forming a dense lining to the utilised swallow's nest.

In this nest the wagtails had successfully reared a brood of young; and in the last week in July, when I examined the nest, it still contained some portions of the egg-shells. Again, built in the straw laid up in the skeleton loft of this same hemmel—a loft formed by a few poles laid across the beams—I found, on August 12th, another nest of the pied wagtail, which contained well-grown young, and which were probably a second nest and brood of the same pair of birds as had already built and bred in the nest of the swallow situate in the roof near by.

Though speaking of the above nest of the swallow as an old one, and probably simply utilised by the wagtail, it may still be considered as possibly usurped; for the swallow frequently uses its nest for more than one season, raising the mud walls when necessary and thus deepening it; and the resident wagtail, which breeds early, had probably taken possession before the return of the swallows from their winter retreat in the far south, and thus might have prevented these birds from reoccupying their nest of a former season.

The swallow (*Hirundo rustica*).—The nest of the swallow, as I have noted it in our rural districts, is usually built at a considerable elevation within farm outhouses, sheds, and hemmels; being built against and adherent to the beams, couples and rafters, as also other portions of the woodwork and stonework of the roof; though, of course, when a building is low, the altitude at which hangs the nest is lessened; and in one instance which has come under my observation, the distance was not more than three feet from the ground. This lowly-hung nest was attached to the side of a beam in the roof of an occupied pigstye, and contained four eggs much incubated; the upper storey of this tiny outbuilding was a hen-house; hence the short beam or two in the roof of the gloomy stye. A second swallow's nest, built in the roof of an unused privy, was barely six feet distant from the ground. A third nest, taken on June 18th, 1881, was peculiar in the fact of its having a lauter of four unincubated eggs lying on their bed of hay and abundant soft fowl feathers; whilst beneath this thick warm lining was a second consisting also of fine hay and a few feathers, upon which lay two other eggs obviously of the present season's laying, and which, on being blown, proved to be quite fresh, the yolk of one of them only being a little stiffened, as might reasonably enough be expected from the heat imparted to them from the bodies of the birds during the process of the second lining of the nest and the egg-laying, combined with the dryness of their situation. This double lauter of eggs was probably due to the death, by accident or natural causes, of the first female owner of the nest, and her partner's taking a second mate who had commenced housekeeping on her own account by having a second lining added to the nest upon which to deposit her own incipient offspring.

Sand martin (*Cotile riparia*).—On June 5th, 1885, I took from its deep burrow in the bank of the stream Blythe, a nest of the sand martin which contained four eggs unincubated, and which was composed of dry grass and grass-stems, and lined with soft fowl feathers and a little dry grass. This nest, like that of the swallow described above, was a double one; for beneath this upper lining upon which rested the four eggs, was a second (a former) lining of fowl feathers, upon which lay two other eggs quite fresh though very dirty. Here, too, in all probability, some fatality had overtaken the original female owner of the nest after she had deposited two of her eggs; and her partner had then found a second mate, whose nearly completed lauter the upper four eggs would be. The sand martin lays from five to six purely white eggs, which, however, are generally more or less soiled and abundantly speckled with the dark-green excreta of the large fleas (Pulex) with which their nests almost invariably swarm.

CHARLES ROBSON.

NOTES CONCERNING THE DISTRIBUTION OF MOLLUSCA IN THE THAMES ESTUARY.

By A. J. JENKINS AND L. O. GROCOCK.

SINCE the publication of the article upon "The Distribution and Habits of the British Hydrobiæ," SCIENCE-GOSSIP, 1890, page 103, it has been our endeavour to try our best to work up the distribution of the various other species of mollusca inhabiting the marshes of the Thames Estuary, with a view to studying the habits and localisation of the brackish-water species in particular, as well as the discovery of the distribution and true limits of the Hydrobiæ and allied forms to be found in close proximity to the river.

All the British Hydrobiæ have been taken from the Thames marshes, and the two species, *Hydrobia similis*, Drap., and *H. Jenkinsi*, Smith, have not up to the present been found elsewhere in Britain.

The district which we decided to investigate is included between the commencement of the Plumstead Marshes, near Woolwich Arsenal, and North Woolwich, upon the Essex bank of the Thames, down to a point three miles below the forts at Tilbury and Gravesend.

Nearly twelve months have elapsed since we commenced working this district in a systematic manner, and during this period the course of the Thames has been followed from Woolwich to below Gravesend, and many excursions have been made to the other side at North Woolwich, Beckton, Coldharbour Point to Purfleet, and over the marshes at Grays, Thurrock, and Tilbury. During these excursions we have indulged our prying propensities to the best of our ability, using our dredges freely over many miles of ditches of fresh and brackish water, at the same time keeping a sharp look-out for terrestrial forms either possessed of shells or destitute of them; carefully recording each day's experience gained, and taking notes of fresh captures.

We have also received much valuable assistance, and have occasionally been accompanied in our expeditions by the Rev. J. W. Horsley, the indefatigable President and Founder of the now flourishing Woolwich District Natural History Society, which under the guidance of Mr. Horsley has organised a series of Saturday half-holiday field-excursions for the study of the fauna and flora of the district.

The marshes bordering the Thames are very extensive, and a considerable portion is devoted to market-gardening and grazing purposes, a large area still remaining almost in its original pristine condition. The great national workshop, Woolwich Arsenal, is built upon the Plumstead Marshes, and a range, fifteen hundred yards in length, is devoted to gun-practice near the Arsenal. Many chemical and manure works are also built upon them. At Purfleet there is a rather extensive salt-marsh.

Lying, as they do, considerably below high-water mark, the marshes were many years ago protected by a river-wall or earthwork. The origin of this gigantic earthwork, which confines the Thames to its present channel, is lost in obscurity, but probably various portions have been constructed at different periods. Intersecting the marshes in various directions are numerous dykes or ditches, which abound in the various forms of life which delight the eye and mind of the biologist, conchologist, and microscopist.

In places near the river the ditches are connected with the Thames by drains and sluices, and such ditches being liable to the overflow of the river occasionally, at high tides, causes the water contained therein to be more or less brackish. These ditches form the habitat of our Hydrobiæ and their allies. A long walk across the marshes in fine weather is very exhilarating and enjoyable; after fogs and heavy rain it is not so pleasant, the roads and paths are then almost impassable owing to mud; the tall coarse grass when wet is very tiring to walk through, and the mist or vapour covering the marshes all around renders the journey very monotonous, which is occasionally varied by the necessity of jumping a tolerably wide and deep dyke, or clambering over very high fences to avoid making a détour of several miles. Sometimes, too, mishap befalls the unwary naturalist, the plank which serves him for a bridge refuses to support him when half across, or he fails to leap properly and gracefully an extra-wide ditch, which ends in his immersion in clear fluid or mud.

The marshes between East Greenwich and Plumstead were frequently investigated between the years 1883-9, rendering it unnecessary to go over the same ground again.

Probably many years have elapsed since the Thames Estuary was thoroughly worked by conchologists, and this is confirmed by the recent publication of localities in which species have long ceased to exist, and by the discovery of the new species of Hydrobia.

A few details respecting the limits of various species may be of interest to the readers of SCIENCE-GOSSIP. The marsh brackish-water shells consist of six species, if we include Mr. Smith's new Hydrobia, which is now generally considered by eminent conchologists, both at home and abroad, to be worthy of specific rank. They are as follows: *Hydrobia ulvæ*, Penn, *H. similis*, Drap., *H. ventrosa*, Mont., *H. Jenkinsi*, Smith, *Assiminia Grayana*, Leach, and *Melampus myosotis*, Mont. A peculiar dwarfed variety of *Littornia rudis* also occurs with *H. ventrosa* in brackish water at Tilbury.

Of these species, *A. Grayana*, *M. myosotis* and *H. ulvæ* are most marine in habit; *H. ventrosa* inhabits ditches which are decidedly more brackish than those which *H. similis* and *H. Jenkinsi* frequent.

H. ulvæ may be taken alive upon mud, and in partially dry ditches at Grays, Tilbury, and Gravesend, by the riverside, and sparingly in brackish-water ditches near Greenhithe village, in company with *H. ventrosa* and *A. Grayana*. It has not yet been taken higher up the river.

Many years ago *H. similis* inhabited ditches between Greenwich and Woolwich, which were occasionally flooded by the tide, and this locality has been given by Mr. J. W. Williams in a recent work published in 1889. This locality was no doubt correct in Jeffreys' time, but they have (in company with other species) long since been forced to migrate lower and lower down the river, owing to the pollution of the ditches by various factories, chemical and gas-works, and Thames sewage. As far back as 1883 not even a dead shell could be obtained from this locality.

Industrious searching for this pretty little mollusc has led us to the conclusion that this species is doomed to speedy extinction in this district. It seems always to have been peculiar in Britain to the Thames marshes, and, like *H. Jenkinsi*, in all probability was originally introduced from abroad. It appears to be limited to a single narrow ditch a few hundred yards in length, and with two exceptions we have not succeeded in finding them elsewhere. Once a dead shell was taken with *H. Jenkinsi* from a ditch at Beckton, and once a single live specimen with the same species between Erith and Darenth Creek. In the same ditch with *H. similis* may be found a number of *H. ventrosa*, a few *Limnæa truncatula*, and dead shells only, of *A. Grayana*.

Occasionally a few shells of *H. similis* have been collected, which are of a clear, pellucid texture. Mr. Marshall has proposed to call this variety *V. candida*, see "Journal of Conchology," vol vi. p. 141. It has been deemed necessary to strictly preserve the habitat of this rare species, so as not to be instrumental in its extermination as a British species.

H. ventrosa inhabits in great abundance brackish-water ditches between Erith and Gravesend, and may be collected on the north bank of the Thames at Purfleet, Grays, and Tilbury. The shells from the different localities vary somewhat, but hardly sufficient to be considered as distinct varieties. A short and rather tumid form occurs in a ditch near the river and training-ships at Grays.

H. Jenkinsi is now, and for some years is likely to be, the most abundant Hydrobia of the Thames marshes. When collected in 1883 in ditches at East Greenwich, it was fairly plentiful there; two years later, a few shells were taken at Plumstead, but they were by no means common at that time. They are now extinct between Greenwich and Woolwich, owing to the same cause which forced *H. similis* and *A. Grayana* to retreat lower down the river. At certain periods the new species fairly swarm in the ditches at Plumstead marshes, upon duck-weed, chara, and the bright green ribbon-like weed *Enteromorpha intestinalis*, Linn., which is so common in brackish water. As mentioned in the above article, they are a very active and hardy species, capable of existing for prolonged periods in quite fresh, and even in hard tap-water.

They have been taken in winter from beneath the ice, and hibernating in the banks of their habitat. Like the other species, the shells from different localities are extremely variable, and several forms differ sufficiently from the type to be considered as distinct varieties. One form in particular which occurs with the type at Beckton is peculiar in having a much shorter spire, and very tumid body whorl. They are strongly carinated and tufted, and the suture is somewhat deeper than the type. Upon the dorsal side there is a considerable bulging out of the penultimate whorl upon the left side, giving the shell a distorted appearance. In this condition they somewhat resemble enlarged *H. similis*. It has been suggested that these examples are shells that have been stopped in growth by the drying up of the ditch, or some other cause. Provisionally it is proposed to call this variety or monstrosity *H. Jenkinsi*, V. *tumida*, Jenkins. This species now exists in considerable abundance in ditches at Beckton, and extends from the Arsenal wall at Plumstead to a point midway between Darenth Creek and Greenhithe. In all probability a few years will find them extending down the river as far as Gravesend. *H. Jenkinsi* was at one time mistaken for *H. similis*, owing to the latter species not being generally known to conchologists, and it was largely distributed to collectors as that species. *Limnæa peregra*, *Planorbis spirorbis*, and *P. complanatus* exist in the same habitat as this Hydrobia.

Assiminia Grayana and *Melampus myosotis* are more or less abundant between Coldharbour Point and Purfleet, and from Grays to three miles below Tilbury Fort, and we have traced them from Greenhithe to below Gravesend. *A. Grayana* exists in abundance in the canal at Gravesend, as well as in ditches between Northfleet and Greenhithe.

Both species are wanderers, and they may frequently be picked up many yards from the water's edge.

About twenty species of common fresh-water mollusca have been collected upon the marshes, the forms which generally prevail upon either side of the river are *Bythinia tentaculata*, *B. Leachii*, *Planorbis spirorbis*, *P. vortex*, *P. complanatus*, *Limnæa peregra*, *L. palustris*, *Physa fontinalis*. The most local are *Planorbis nautileus*, *P. contortus*, *Limnæa stagnalis*, *L. truncatula*, and *Physa hypnorum*.

For terrestrial shells we can only testify to species upon our side of the river, and no doubt with more leisure many more species will be discovered. *Helix nemoralis* and its varieties *bimarginata*, *libellula*, and *rubella* are the prevailing marsh forms, together with *Arion ater*, *Succinea putris*, *S. elegans*, *Helix cantiana*, *H. rufescens*, *H. virgata*, *H. hispida*, *H. caperata* and *H. concinna*. *Helix hortensis* and *Cyclostoma elegans* are found in the neighbourhood of the chalk.

So far our list comprises upwards of sixty species and varieties of land and freshwater shells inhabiting the marshes of the Thames Estuary. Another twelve months' work may add largely to this list of District Mollusca, as many forms, like the slugs and Zonites, have not been yet properly worked up.

THE ROMAUNT OF BEDEGAR.

AN AUTOBIOGRAPHY.

By the REV. H. FRIEND, F.L.S.

I WAS born at Rosebower, on Solway Moss, in the summer of 1880. Having inherited a precocious tendency to look about me, and made inquiry respecting things in general, and my own history in particular, it dawned upon me while I was yet very youthful that I might find profit in looking up my family pedigree. I had not the faintest idea when I set to work how arduous a task I had undertaken, nor could I have conceived that our history would show so many changes and vicissitudes, or lead me back to so hoary an age, as I eventually found to be the case; and as I feel sure there are very few, even among the students of genealogies and family history who are fully acquainted with these details, I have ventured to write my autobiography. In so doing, I have the impression that I am the first who has attempted to give anything like a connected or exhaustive account of the subject from the standpoint of the genealogist or historian. I even flatter myself that those persons who have paid special attention to the place which my ancestors have filled in the economy of medicine are unable to present so clear an account of me as I am now about to lay before you.

Our family name was Deker, or Degar, which by a curious coincidence means in the languages of the East very much what "dagger" means in English. It is, indeed, curious to observe how frequently this name, slightly modified in various ways, is used in a great number of languages to convey the idea of something sharp or piercing. At the risk of being regarded as boastful, I will at once inform my readers that I have traced our family name back to very ancient times, for I find in the oldest historical work now in existence that one of my remote ancestors, Ben-deker by name, was appointed by Solomon, the King of Israel, to be one of the twelve officers whose duty it was to provide victuals for the king and his household. This mention of Ben-deker in Jewish history is sufficient to show that already in Solomon's day Deker had become an established name. Learned writers are agreed that this name is derived from a word which means to pierce, or stab; this word we find in the Hebrew language under the form of Dakar. Hence Deker means the stabber, or he who pierces; and as Ben is the word for son, Ben-deker means the son of the stabber, then the little stabber. I have reason to believe that the name was given to the earliest representative of our family on account of his skill in the use of the spear or sword in times of war; for I find that when Jehu went forth to war he was accompanied by a member of our family who bore the name of Bidekar, and had been promoted to the post of captain on account of his chivalry. The reader may consult 1 Kings iv. 9, and 2 Kings ix. 25.

Now every one is aware that, by the association of ideas, names are continually being transferred from one thing to another which bears some resemblance, in one way or another, to the original. Thus the word needle is applied to a little pointed instrument used by industrious girls and housewives, as well as to an ancient monument of a similar shape which once stood on Egyptian soil, but now adorns the Thames Embankment. The musical pipe of the Hebrew and the tobacco pipe of the smoker bear the same name, though their uses are so widely different, because they are each hollow; and hence we have many other things called pipes for the same reason. In exactly the same way the people who first used the word Dakar in the sense of stabbing, called not only a clever soldier Deker, a stabber, but applied the same term to such plants or other things as pricked or pierced the skin of the unwary, just as the Scotch thistle is reputed to have stabbed or pierced the foot of a Dane. In course of time, therefore, the name Bidekar, or Bedegar, as some people pronounced it, i.e., the little stabber, came to be the recognised term for a thistle, as being the most common of the prickle-bearing plants. We therefore have now to turn away from the historical personages who, a thousand years before the birth of Christ, had made themselves famous by the use of the spear, and look at the thistle, which had for a similar reason inherited the same name; and in order to carry on my story it will be necessary to say that the Arab physicians must next be consulted, seeing that they for some centuries bestowed upon my relatives the most scrupulous attention. Perhaps I ought to remark that for a long period these learned men took an important part in the spread of medical information among the other races of mankind, and having discovered certain remedies for the ills of the flesh, they introduced these to the strangers beyond the seas, along with the names by which they were known in Arabia. It was in this way that the Greeks, Romans, and other peoples of early as well as more modern times came into the possession of various medicinal herbs which they often knew only by their Arabic names. When they wished to enter these names in their list of medicines, however, it was necessary that they should add an equivalent term from their own vocabulary which should make it possible for others to identify the article when necessary; and it is thus that I have found myself (in the person of my ancestors) transferred from Arabia Felix to classical Greece, where the people were wont to speak of me under two names, viz., Bedegar and Akantha-leuke. I confess that, while I felt flattered at seeing my forefathers thus introduced to the famous Grecians, I could not at first understand what they meant by this new name by which they translated the old family name of Bedegar. Upon inquiry, however, I found that leuke was a Greek term meaning white, and akantha soon suggested to my mind a spinous or thorny plant usually known as the acanthus. Thus I found that the Greek regarded the white acanthus as being similar to if not the same as bedegar. This idea was soon abundantly confirmed, for I read that when a Roman dealer in herbs saw the physician display his bedegar, he exclaimed, "Why, that is *Spina alba!*" I happened to know enough Latin to be able to translate these words, and I found that while the word alba, like the Greek leuke, meant white, spina corresponded with acanthus. All this is matter of history, and, if it were necessary, I could easily mention the names of ancient sages who have favoured my predecessors with their kindly notice.

While I cannot help feeling a little proud of the distinguished position which the name of our family was securing during the early ages of the Christian era, there is one matter which has given me considerable anxiety. I am sorry to find that when the early physicians, who lived in lands remote from that which constituted my early home, found that they could not always obtain the genuine Bedegar for their patients, they applied the famous name to other articles found nearer home; and thus the honour which had for so many years centred about the Arab name began to be dimmed. Of this I shall have to say a little more shortly, but it is needful at this point to refer to a few of the other names by which we came to be known, either occasionally or regularly, in various parts of Europe. I must also show how many ups and downs our family history experienced, owing to the translation of those names from one language into another, and what curious results followed this process. One thing is a source of comfort to me, however, and it is this. No matter where we might be carried by the merchant, or what vicissitudes we might experience in going from country to country, the people almost invariably associated our old family name with the new names which they gave us, and thus I can boast the possession of the original title to-day: though, as will be seen, that name has been shifted from the spine-bearing thistle to a totally different plant or growth.

(*To be continued.*)

THE TELEGRAPHIC COMMUNICATION BETWEEN GREAT BRITAIN, EUROPE, AMERICA, AND THE EAST.

By George Walter Niven.

THERE are at present twenty-six Submarine Cable Companies, the combined capital of which is about forty million pounds sterling. Their revenue, including subsidies, amounts to 3,204,060*l.*; their reserves and sinking funds to 3,610,000*l.*; and their dividends are from one to 14¾ per cent. The receipts from the Atlantic cables alone amount to about 800,000*l.* annually.

The number of cables laid down throughout the world is 1045, of which 798 belong to governments, and 247 to private companies. The total length of those cables is 120,070 nautical miles, of which 107,546 are owned by private telegraph companies, nearly all British; the remainder, or 12,524 miles are owned by governments.

The largest telegraphic organisation in the world is that of the Eastern Telegraphic Company with seventy cables of a total length of 21,859 nautical miles. The second largest, is the Eastern Extension, Australasia and China Telegraph Company, with twenty-two cables of a total length of 12,958 nautical miles. The Eastern Company work all the cables on the way to Bombay, and the Eastern Extension Company from Madras eastwards. The cables landing in Japan, however, are owned by a Danish Company, the Great Northern. The English station of the Eastern Company is at Porthcurno, Cornwall, and through it passes most of the messages for Spain, Portugal, Egypt, India, China, Japan, and Australia.

three cables around our shores of a total length of 1489 miles. If we include India and the Colonies, the British Empire owns altogether two hundred and sixteen cables of a total length of 3811 miles.

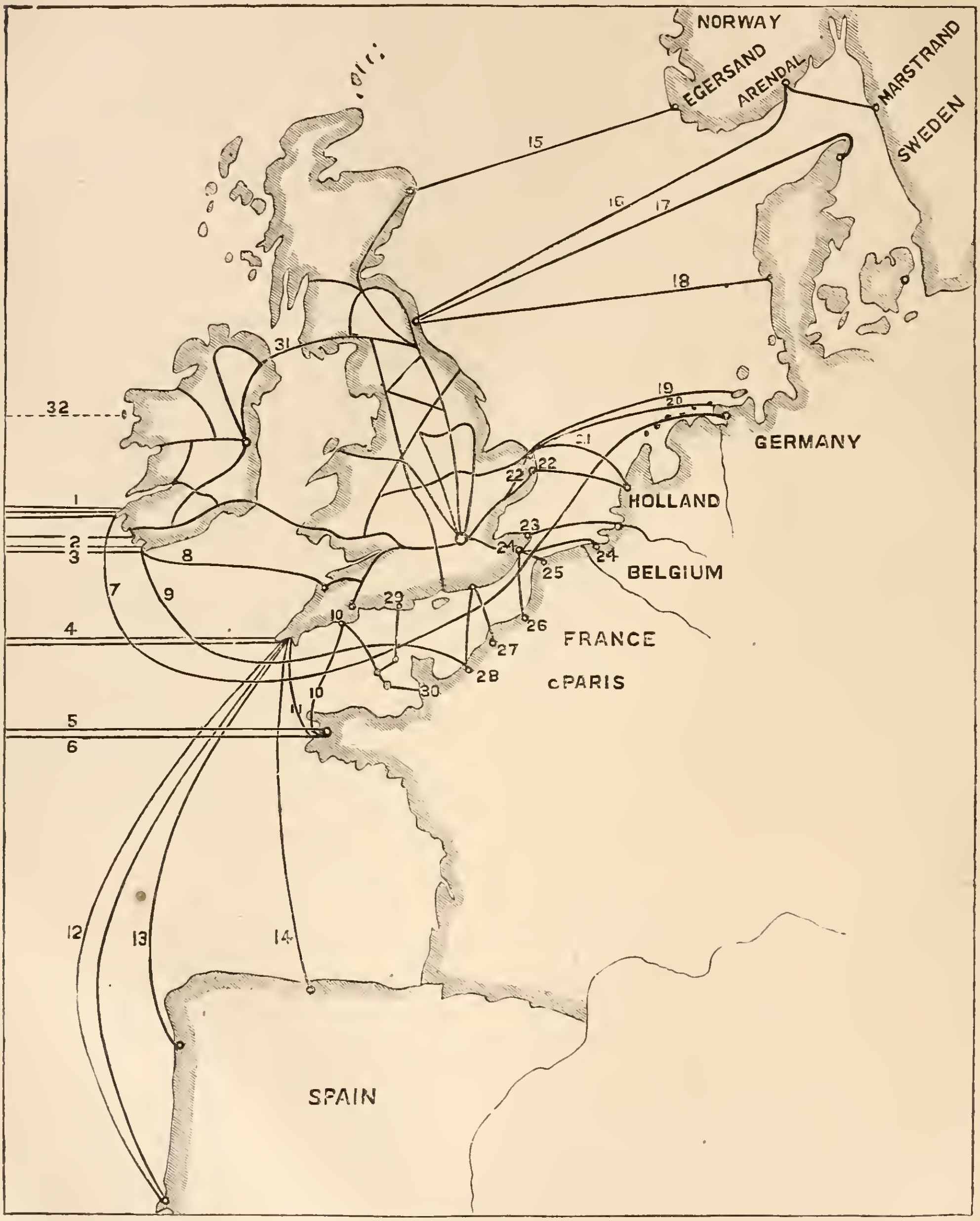

Fig. 3.—Map showing Cables from Great Britain to America and the Continent. 1–18, private companies; 19–31, Government Cables; 32, proposed Cable.

The third largest cable company is the Anglo-American Telegraph Company, with thirteen cables of a total length of 10,196 miles.

The British Government has one hundred and

The longest Government cable in British waters, is that from Sinclair Bay, Wick, to Sandwick Bay, Shetland, of the length of 122 miles, and laid in 1885. The shortest being four cables across the

Gloucester and Sharpness Canal, at the latter place, and each less than 300 feet in length.

Of Government cables the greatest number is owned by Norway with two hundred and thirty-six, averaging however less than a mile each in length.

eighty-nine cables; and Germany third with 1579 miles, and forty-three cables.

Britain being fourth with ninety miles less.

The oldest cable still in use is the one that was first laid, that namely from Dover to Calais. It dates from 1851.

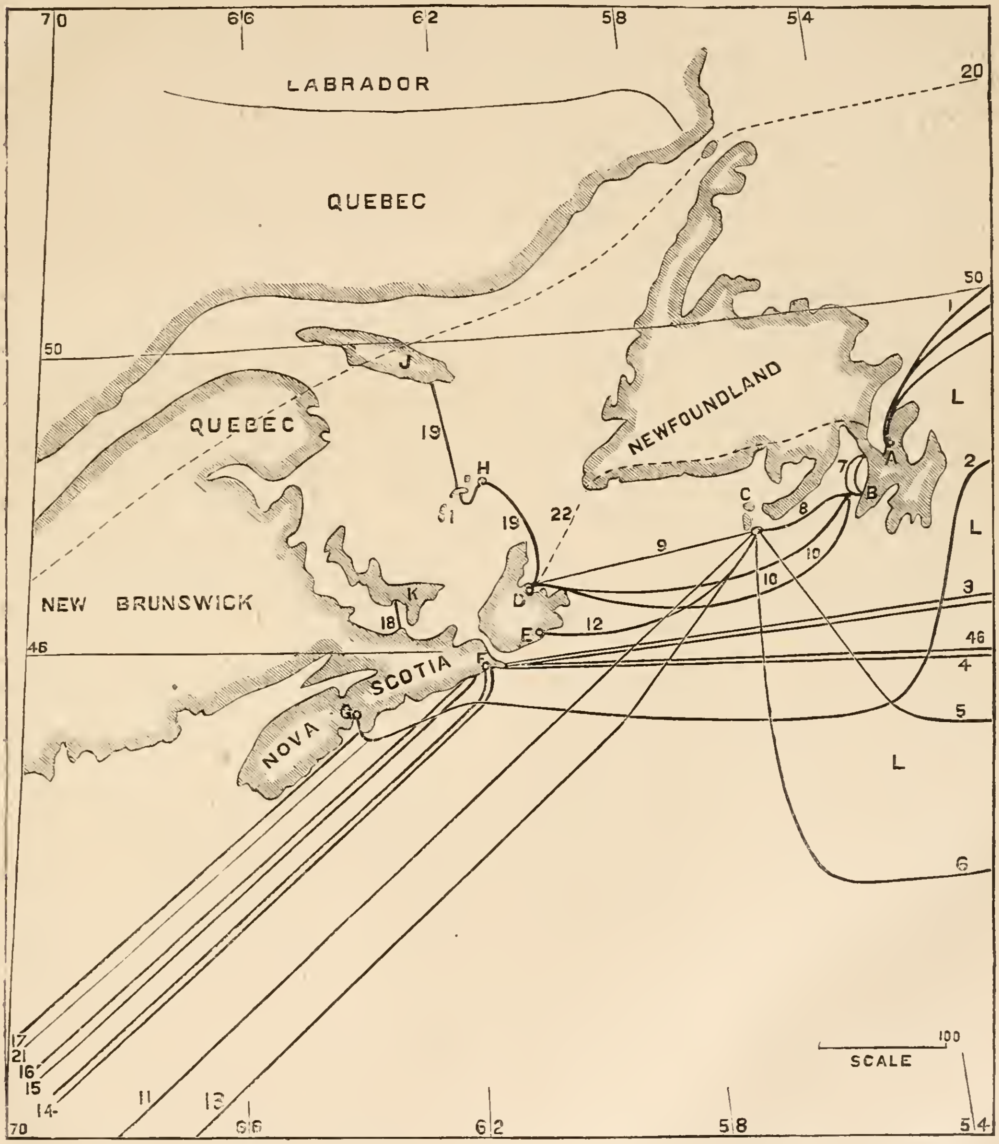

Fig. 4.—Map showing the Main Cables from Europe, and their connections with Canada and the United States. References to places—A, Heart's Content; B, Placentia; C, St. Pierre Miquelon; D, North Sydney, Cape Breton Island; E, Louisbourg; F, Canso, Nova Scotia; G, Halifax; H, Bird Rock; I, Madeline Isles; J, Anticosti; K, Charlotte Town, Prince Edward's Isle; LLL, Banks of Newfoundland.

The greatest mileage is owned by the Government of France with 3269 miles of the total length of fifty-one cables.

The next being British India with 1714 miles, and

The two next oldest cables in use being those respectively from Ramsgate to Ostend; and St. Petersburg to Cronstadt, and both laid down in 1853.

Several unsuccessful attempts were made to connect England and Ireland by means of a cable between Holyhead and Howth; but communication between the two countries was finally effected in 1853, when a cable was successfully laid between Portpatrick and Donaghadee (31).

As showing one of the dangers to which cables laid in comparatively shallow waters are exposed, we may relate the curious accident that befell the Portpatrick cable in 1873. During a severe storm in that year the Port Glasgow ship "Marseilles" capsized in the vicinity of Portpatrick, the anchor fell out and caught on to the telegraph cable, which, however, gave way. The ship was afterwards captured and towed into Rothesay Bay, in an inverted position, by a Greenock tug, when part of the cable was found entangled about the anchor.

The smallest private companies are the Indo-European Telegraph Company, with two cables in the Crimea of a total length of fourteen and a half miles; and the River Plate Telegraph Company with one cable from Monte Video to Buenos Ayres, thirty-two miles long.

The smallest Government telegraph organisation is that of New Caledonia with its one solitary cable one mile long.

We will now proceed to give a few particulars regarding the companies having cables from Europe to America.

The most important company is the Anglo-American Telegraph Company, whose history is inseparably connected with that of the trials and struggles of the pioneers of cable laying.

Its history begins in 1851 when Tebets, an American, and Gisborne, an English engineer, formed the Electric Telegraph Company of Newfoundland, and laid down twelve miles of cable between Cape Breton and Nova Scotia. This company was shortly afterwards dissolved, and its property transferred to the Telegraphic Company of New York, Newfoundland and London, founded by Cyrus W. Field, and who in 1854 obtained an extension of the monopoly from the Government to lay cables.

A cable, eighty-five miles long, was laid between Cape Breton and Newfoundland (22).

Field then came to England and floated an English company which amalgamated with the American one under the title of the Atlantic Telegraph Company.

The story of the laying of the Atlantic Cables of 1857 and 1865, their successes and failures has often been told, so we need not go into any details. It may be noted, however, that communication was first established between Valentia and Newfoundland on 5th August 1858, but the cable ceased to transmit signals on 1st September following. During that period, ninety-seven messages had been sent from Valentia, and two hundred and sixty-nine from Newfoundland. At the present time, the ten Atlantic Cables now convey about ten thousand messages daily between the two continents. The losses attending the laying of the 1865 Cable resulted in the financial ruin of the Atlantic Company, and its amalgamation with a new company, The Anglo-American. In 1866 the Great Eastern successfully laid the first cable for the new company, and with the assistance of other vessels succeeded in picking up the broken end of the 1865 cable and completing its connection with Newfoundland.

The three cables of this company presently in use and connecting Valentia in Ireland with Heart's Content in Newfoundland, were laid in 1873, 1874, and 1880; and (1) are respectively 1886, 1846, and 1890 nautical miles in length. This company also owns the longest cable in the world, that, namely from Brest in France to St. Pierre Miquelon, one of a small group of islands off the south coast of Newfoundland, and which, strange to say, still belongs to France (6).

The length of this cable is 2685 nautical miles, or 3092 statute miles. It was laid in 1869. There are seven cables of a total length of 1773 miles, connecting Heart's Content, Placentia Bay and St. Pierre, with North Sydney, Nova Scotia, and Duxbury near Boston, belonging to the American Company. Communication is maintained with Germany and the rest of the continent by means of a cable from Valentia to Emden 846 miles long (7), and a cable from Brest to Salcombe, Devon, connects the St. Pierre and Brest cable with the London office of the company (10).*

The station of the Direct United States Cable Company is situated at Ballinskelligs Bay, Ireland (2). Its cable was laid in 1874–5, and is 2565 miles in length. The terminal point on the other side of the Atlantic is at Halifax, Nova Scotia, from whence the cable is continued to Rye Beach, New Hampshire a distance of 536 miles and thence by a land line of 500 miles to New York (17).

The Commercial Cable Company's station in Ireland is at Waterville, a short distance from Ballinskelligs (3). It owns two cables laid in 1885; the northern cable being 2350, and the southern 2388 miles long. They terminate in America at Canso, Nova Scotia. From Canso a cable is laid to Rockfort, about thirty miles south of Boston, Mass.; a distance of 518 miles (16), and another is laid to New York 840 miles in length (15). This company has direct communication with the Continent by means of a cable from Waterville to Havre of 510 miles (9), and with England by a cable to Weston-super-Mare, near Bristol, of 328 miles (8).

* Cables not fully described in the text, Map B. Eight cables at the Anglo-American Company; 7, Heart's Content to Placentia, two cables; 8, Placentia to St. Pierre; 9, St. Pierre to North Sydney; 10, Placentia to North Sydney, two cables; 11, St. Pierre to Duxbury; 18, Charlotte's Town to Nova Scotia; 19, Government Cable, North Sydney to Bird Rock, Madeline Isles, and Anticosti; 21, Halifax and Bermuda Cable Company's proposed cable to Bermuda.

The Western Union Telegraph Company (the lessees of the lines of the American Telegraph and Cable Company) has two cables from Sennen Cove, Land's End, to Canso, Nova Scotia (4). The cable of 1881 is 2531, and that of 1882 is 2576 miles in length. Two cables were laid in November 1889 between Canso and New York (14).

The Compagnie Française du Telegraphe de Paris à New York, has a cable from Brest to St. Pierre Miquelon, of 2242 miles in length (5), from thence a cable is laid to Louisbourg, Cape Breton (12), and another to Cape Cod (13). It has also a cable from Brest to Porcella Cove, Cornwall (11).

Those ten cables owned by the six companies named, of the total mileage of 22,959, not counting connections, represent the entire direct communication between the continents of Europe and North America.

A new company, not included in the preceding statistics, proposes to lay a cable from Westport, Ireland, to some point in the Straits of Belle Isle on the Labrador coast (Map A 32, Map B 20).

The station of the Eastern Telegraph Company is at Porthcurno Cove, Penzance, from whence it has two cables to Lisbon, one laid in 1880, 850 miles long, the other laid in 1887, 892 miles long (12), and one cable to Vigo, Spain, laid in 1873, 622 miles long (13). From Lisbon the cable is continued to Gibraltar and the East, whither we need not follow it, our intention being to confine ourselves entirely to a brief account of those cables communicating directly with Europe and America. As already stated, this company has altogether seventy cables of a total length of nearly twenty-two thousand miles.

The Direct Spanish Telegraph Company has a cable, laid in 1884, from Kennach Cove, Cornwall, to Bilbao, Spain, 486 miles in length (14).

Coming now to shorter cables connecting Britain with the Continent, we have those of the Great Northern Telegraph Company, namely, Peterhead to Ekersund, Norway, 267 miles (15), Newbiggin, near Newcastle, to Arendal, Norway, 424 miles, and thence to Marstrand, Sweden, 98 miles.

Two cables from the same place in England to Denmark (Hirstals and Sondervig) of 420 and 337 miles respectively (17 and 18).

The Great Northern Company has altogether twenty-two cables, of a total length of 6110 miles. The line from Newcastle is worked direct to Nylstud, in Russia—a distance of 890 miles—by means of a "Relay" or "Repeater," at Gothenburg. The Relay is the apparatus at which the Newcastle current terminates, but in ending there it itself starts a fresh current on to Russia.

The other Continental connections belong to the Governmment, and are as follows: two cables to Germany, Lowestoft to Norderney, 232 miles, and to Emden, 226 miles (19 and 20).

Two cables to Holland: Lowestoft to Zandvoort, laid in 1858 (21), and from Benacre, Kessingland, to Zandvoort (22).

Two cables to Belgium: Ramsgate to Ostend (23), and Dover to Furness (24).

Four cables to France: Dover to Calais, laid in 1851 (25), and to Boulogne (26), laid in 1859; Beachy Head to Dieppe (27), and to Havre (28).

There is a cable from the Dorset coast to Alderney and Guernsey, and from the Devon coast to Guernsey, Jersey, and Coutances, France (29 and 30).

A word now as to the instruments used for the transmission of messages. Those for cables are of two kinds, the Mirror Galvanometer, and the Syphon Recorder, both the product of Sir Wm. Thompson's great inventive genius.

When the Calais-Dover and other short cables were first worked, it was found that the ordinary needle instrument in use on land-lines was not sufficiently sensitive to be affected trustworthily by the ordinary current it was possible to send through a cable. Either the current must be increased in strength, or the instrument used must be more sensitive. The latter alternative was chosen, and the Mirror-Galvanometer was the result. The principle on which this instrument works may be briefly described thus: the transmitted current of electricity causes the deflection of a small magnet, to which is attached a mirror about the three-eighths of an inch in diameter, a beam of light is reflected from a properly-arranged lamp, by the mirror, on to a paper scale. The dots and dashes of the Morse code are indicated by the motions of the spot of light to the right and left respectively of the centre of the scale.

The Mirror-Galvanometer is now almost entirely superseded by the Syphon-Recorder. This is a somewhat complicated apparatus, with the details of which we need not trouble our readers. Suffice it for us to explain that a suspended coil is made to communicate its motions, by means of fine silk fibres, to a very fine glass syphon, one end of which dips into an insulated metallic vessel containing ink, while the other extremity rests, when no current is passing, just over the centre of a paper ribbon. When the instrument is in use the ink is driven out of the syphon in small drops by means of an electrical arrangement, and the ribbon underneath is at the same time caused to pass underneath its point by means of clockwork. If a current be now sent through the line, the syphon will move above or below the central line thus giving a permanent record of the message, which the mirror-instrument does not. The waves written by the syphon above the central line corresponding to the dots of the Morse Code, and the waves underneath corresponding to the dashes.

The cost of the transmission of a cablegram varies from one shilling per word, the rate to New York and east of the Mississippi, to ten shillings and sevenpence per word, the rate to New Zealand. In order to minimise that cost as much as possible, the use of codes, whereby one word is made to do duty for a lengthy phrase, is much resorted to. Of course, those code messages form a series of words having no apparent relation to each other, but occasionally queer sentences result from the chance grouping of code words. Thus a certain tea firm was once astonished to receive from its agent abroad the startling code message—"Unboiled babies detested"!

Suppose we now follow the adventures of a few cablegrams in their travels over the world.

A message to India from London by the cable route requires to be transmitted eight times at the following places:—Porthcurno (Cornwall), Lisbon, Gibraltar, Malta, Alexandria, Suez, Aden, Bombay.

A message to Australia has thirteen stoppages; the route taken beyond Bombay being via Madras, Penang, Singapore, Banjoewangie and Port Darwin (North Australia); or from Banjoewangie to Roebuck Bay (Western Australia).

To India by the Indo-European land lines, messages go through Emden, Warsaw, Odessa, Kertch, Tiflis, Teheran, Bushire (Persian Gulf), Jask and Kurrachee, but only stop twice between London and Teheran—namely, at Emden and Odessa.

Messages from London to New York are transmitted only twice—at the Irish or Cornwall stations, and at the stations in Canada. Owing to the great competition for the American traffic the service between London, Liverpool, and Glasgow and New York is said to be much superior to that between any two towns in Britain. The cables are extensively used by stockbrokers, and it is a common occurrence for one to send a message and receive a reply within five minutes.

During breakages in cables messages have sometimes to take very circuitous routes. For instance, during the two days, three years ago, that a tremendous storm committed such havoc amongst the telegraph wires around London, cutting off all communication with the lines connected with the Channel cables at Dover, Lowestoft, &c., it was of common occurrence for London merchants to communicate with Paris through New York. The cablegram leaving London going north to Holyhead and Ireland, across the Atlantic to New York and back via St. Pierre to Brest and thence on to Paris, a total distance of about seven thousand miles.

Two years ago, when the great blizzard cut off all communication between New York and Boston, messages were accepted in New York, sent to this country, and thence back to Boston.

Some time ago the cables between Madeira and St. Vincent were out of order, cutting off communication by the direct route to Brazil, and a message to reach Rio Janeiro had to pass through Ireland, Canada, United States, to Galveston, thence to Vera Cruz, Guatemala, Nicaragua, Panama, Ecuador, Peru, Chili,; from Valparaiso across the Andes, through the Argentine Republic to Buenos Ayres, and thence by East Coast cables to Rio Janeiro, the message having traversed a distance of about twelve thousand miles and having passed through twenty-four cables and some very long land lines, instead of passing, had it been possible to have sent it by the direct route, over one short land line and six cables, in all under six thousand miles.

Perhaps some of our readers may remember having read in the newspapers of the result of last year's Derby having been sent from Epsom to New York in fifteen seconds, and may be interested to know how it was done. A wire was laid from near the winning-post on the racecourse to the cable company's office in London, and an operator was at the instrument ready to signal the two or three letters previously arranged upon for each horse immediately the winner had passed the post. When the race begun, the cable company suspended work on all the lines from London to New York and kept operators at the Irish and Nova Scotian Stations ready to transmit the letters representing the winning horse immediately, and without having the message written out in the usual way. When the race was finished, the operator at Epsom at once sent the letters representing the winner, and before he had finished the third letter, the operator in London had started the first one to Ireland. The clerk in Ireland immediately on hearing the first signal from London passed it on to Nova Scotia, from whence it was again passed on to New York. The result being that the name of the winner was actually known in New York before the horses had pulled up after passing the judge. It seems almost incredible that such information could be transmitted such a great distance in fifteen seconds, but when we get behind the scenes and see exactly how it is accomplished, and see how the labour and time of signalling can be economised, we can easily realise the fact.

The humours of telegraphic mistakes have often been described; we will conclude by giving only one example. A St. Louis merchant had gone to New York on business, and while there received a telegram from the family doctor, which ran—"Your wife has had a child, if we can keep her from having another to-night, all will be well." As the little stranger had not been expected, further enquiry was made and elicited the fact that his wife had simply had a "chill"! This important difference having been caused simply by the omission of a single dot.

— · — ·   · · · ·   · ·   · — · ·   · — · ·
c h i l l = chill

— · — ·   · · · ·   · ·   · — · ·   — · ·
c h i l d = child

DUCKING: A LINCOLNSHIRE SKETCH.

By Gregory O. Benoni.

THE season for wild-fowling has come round again with the fall of the leaf, and the chilly nights and frosty mornings of early winter; and, if the weather should continue favourable, thousands of birds will be killed or taken by the decoy-men and long-shore gunners; to say nothing of those shot by sportsmen on the brooks and ponds of the midlands. So a word about "ducking," or the taking of water-fowl by strategy, may not be out of place; especially as it is one of the oldest English sports.

Why should we not say "ducking" when speaking or writing of the pastime we are about to describe, as the men engaged in the business do? We use "shooting" and "hunting" with confidence, and ducking is as well-born an English word as either, and quite as old apparently. In the Manor-Rolls of Scotter, a village in Lincolnshire—formerly the centre of a district productive of many wild-fowl—we find the following entry: "No man of the inhabitantes of Scoter or Scawthorpe shall fishe nor goe a ducking within the Lordes severall watters—1578." Scotter was evidently innocent, very innocent, of a school board in the palmy days of the Manor Courts, whatever it may be now. But leaving the interesting relics of a bygone England to entrust the defence of their quaint spelling to antiquarian pens, we will take a stroll some miles to the north-east of the "severall watters" of Scawthorpe, and "goe a ducking" with any lover of country life who cares to accompany us.

It was a mild bright January morning, with a gentle north-west wind and rising barometer, when a party of us set out to visit the decoy—where the best-flavoured teal in England are lured to their doom—rejoicing on our way over the cessation of the black north-easter, which had alternately pelted us with rain and blinded us with snow for a fortnight past. All told we numbered only four, "the squire," two naturalists, and a Londoner, who had deserted civilised existence in Babylon for a time, for the purpose of studying the untamed agriculturist in his native wilds. The state of the weather of late had been most detrimental to all our attempts at field or cover sport, but had signally favoured the decoy-man by driving flocks of hungry fowl to take refuge in his pond. A severe and prolonged frost would not have brought him so lucky a windfall; the birds would have been more hungry and eager if possible, but there would have been fewer of them inland, and the work of capturing them would have been infinitely more tedious. So long as the cold keeps away the decoy man can "sleep like a Christian"; but let "Frosty Jack" only nip his sheltered low-lying waters, and night becomes turned into day at once, with more than the day's toil. For at any cost of money and labour large open spaces must be preserved in the pond, and "the pipes" kept free from ice. The birds need open water to rest and sport on, and if they cannot find it in the decoy would soon fly away to the still unfrozen brooks and rivers, or to the seashore. So, when the "decoy rises" on a frosty evening, and the last bird has departed to the feeding grounds, the master ducker and an assistant begin the work of clearing the ice away by moon or lamplight, as the case may be, and toil on till the grey of dawn warns them to be gone ere the return of the feathered multitude.

Fortified with a substantial breakfast we set off on foot for the decoy-farm, whiling away the time as we went by combating the squire's assertion that the barometer was the true divinity of his family, and that the adoration of the rain-god was as common in England as in Africa, with the single difference that he is regarded as a beneficent being in the sunny south, and as a mischievous marplot in our more northern regions. Our way led us along a dirty footpath, by the side of a muddy road, where ash and chestnut-leaves still lay in sheltered spots, bright and fresh as if they had only been shorn by the frost of the night before. The moss-grown trunks of the hedgerow trees glistened with moisture, and looked uninviting enough, yet their dank branches formed the happy hunting-ground of numbers of blue-tits, and their long-tailed cousins, who called merrily to one another as they searched the branches for insects. Presently we reached a little hamlet standing on the brow of the slope which forms the eastern boundary of the Trent valley, and turning off to the right, we tramped across turnip and stubble fields abounding in birds, which had collected on the drier sand and loam during the stormy weather, in preference to the heavy clay of the higher lands. Skirting the side of a plantation of Scotch fir and spruce, where the sunshine had brought out the squirrels to busy themselves with the fir-cones, we walked down a straight road, bounded on each side by a wide ditch, or "dyke," as the natives call it, till we reached our destination on the wide-spreading river flat.

The decoy-house was formerly the dwelling of the family who owned the surrounding farms; but the place came under the hammer when the race died out in the male line, and fell into the hands of a land-jobber, who cut down the miniature forest planted to protect the decoy from disturbance, leaving only a fringe of trees of old growth to shield the pond until a fresh cover of fast-growing young ones should spring up to surround it. Finally the home-farm passed into the hands of the head game-keeper and master ducker of the late proprietor, now I am sorry to say—for the sake of the duck-lore he possessed—gathered to his fathers at a very ripe old age indeed. On knocking at the door and inquiring whether the master was in, we learned that he was away from the house; but, before disappointment could prey on our hearts, the old man's once buxom dame put her head out of an upper window to survey us, in that peculiar matter-of-fact, what-do-you-want-here kind of way which defies description; and, catching a sight of our host, set our minds at rest with a "Morning to you, squire. He's in th' 'coy. I'll shout for th' lad, an' he'll ta' ye to him. Mind you're quiet now agoin'!"

A guide having appeared in answer to a full-lunged cry from the mistress of the place—no wonder the ducks needed a copse to dull the clamour of the outer world—we passed through the neglected pleasure-grounds where signs of former care lay on every side, till we were brought to a standstill in an open alley; while the boy who conducted us went in search of his grandfather.

Our halting-place was a pretty nook from which you could catch a glimpse of the house at one end of the path, and of two or three stately Scotch firs overhanging the decoy at the other. A stone vase, half grown over with ivy, stood in the centre of the glade, and formed a trysting place for the rabbits all the afternoon and evening, for the bunnies knew by some process of inductive reasoning that they were in sanctuary here, as no gun can be fired near the decoy. The lower step of the vase, which rose about an inch above the surrounding turf, bore witness to the frequent visits of the thrushes, for it was covered with broken snail-shells. In the early morning the birds come from near and far with the land-snails they have found, and beat them ruthlessly to death on the stone. It is not everywhere that they can find such a convenient anvil, in this stretch of low-lying country; where the surface-soil is usually warp, peat, or sand free from pebbles; so the quiet glade is the theatre of many a molluscan tragedy.

(*To be continued.*)

NOTES ON NEW BOOKS.

AMERICAN SPIDERS AND THEIR SPINNING-WORK, by Dr. Henry C. McCook (Philadelphia: published by the Author), vol. ii. This perfectly delightful, beautifully illustrated, well-written monograph on the natural history of the orb-weaving spiders of the United States, more especially with regard to their industry and habits, is now complete. It is a work of marvellous and patient single-handed industry, the result of many years' observation. We have already spoken of the first vol.; it only remains to say the second is as good, if not better, were the latter possible. Indeed, the author declares it is just possible the second vol. will be more interesting both to the scientific and the general public than the first. It takes up the life-history of spiders, and follows them literally from birth to death. Moreover it deals with fossil spiders and ancestral araneads. Dr. McCook in this highly readable volume also treats upon the courting and mating of spiders; their maternal skill and devotion; their means of communion with their environment; their gossamer voyaging through the air and traps in the ground; their friends and foes; their mimicries and strange disguises. The volume runs to nearly 500 pages, and is illustrated by about four hundred cuts, in addition to five large and artistically coloured plates.

Eighth Annual Report of the United States Geological Survey, 2 vols, by J. W. Powell, Director (Washington: Government Printing Office). These ever-welcome vols. to English and other geologists are got up and distributed with an artistic taste and liberality our English Survey (thanks to the niggardly Philistinism of our British Government) knows nothing of. The volumes include not only the clear and lengthy, well-digested "Report of the Director," reviewing all the stratigraphical, mineralogical, and palæontological work done by the able and earnest band of geologists who are proud to serve under such a chief, but also the administrative reports of the heads of the divisions of survey. Then follow the individual reports of the geologists and mineralogists entrusted with special work. These are illustrated with almost artistic prodigality, but the latter is intensely utilitarian, for the coloured maps, diagrams, and scenic woodcut illustrations bring vividly before the mind the points which the field workers wish attention to be drawn to.

Monographs of the U. S. Geological Survey, vols. xv. (2 parts) and xvi. (Washington: Government Printing Office). These vols. contain records of special work by special scientific workers. Thus, we have one on "The Potomac or Younger Mesozoic Flora," by W. M. Fontaine, with detailed descriptions of the fossil plants found therein (abundantly illustrated). Indeed, no fewer than 180 plates occupy a volume alone, in order to illustrate the first part of vol. xv. Volume the sixteenth is an exhaustive monograph, or special report, by J. G. Newberry, on "The Palæozoic Fishes of North America," and is illustrated by fifty-three splendidly lithographed plates.

Natural History of the Animal Kingdom, by W. F. Kirby (London: S. P. C. K.). This is a gorgeously got-up volume both internally and externally, crowded with too highly coloured natural history objects, of which there are about 850 displayed. The work (a quarto vol.) is divided into three parts—mammalia, birds, and one (the third part) capaciously including, like Noah's ark, reptiles, amphibia, fishes, insects, worms, molluscs, zoophytes, &c. Mr. Kirby has very ably and accurately written up to these too-Germanly coloured plates, which have evidently been used from Professor Von Schubert's book. It is, however, a capital natural history picture book.

Of the next set of prettily got-up, well-printed, and well-written little volumes, it is hardly possible to speak too highly. Each is written by the man best capable of knowing what he is talking about on the subject; and yet the price of these excellent manuals is remarkably low. The S. P. C. K. is to be congratulated on taking up departments of knowledge which are useful and therefore Christian. We allude to *Soap-Bubbles*, by Prof. C. V. Boys; *Spinning-Tops*, by Prof. J. Perry; and *The Birth and Growth of Worlds*, by Prof. A. H. Green.

The Autobiography of the Earth, by the Rev. H. W. Hutchinson (London: Edward Stanford), is a delightfully written and thoroughly accurate popular work on geology, well-calculated to engage the interest of readers in the fascinating study of the Stony Science.

Fresh-Water Aquaria, by the Rev. Gregory C. Bateman (London: L. Upcott Gill). A well-written description of these domestic water-gardens and vivaria. Also well-illustrated, although most of the illustrations are very familiar to the editor. The author has made the fullest use of all who have written before on this interesting subject, and has therefore produced a very useful little manual.

Poems, by Nina Layard (London: Longmans). The authoress of this daintily got-up volume is well known to the readers of the SCIENCE-GOSSIP by her able papers, and replies to the comments thereon, concerning such evolutionary subjects as "Vestiges," &c. Poems, as a rule, lie outside our line of book notices; but it is a genuine pleasure to recommend this little book for its graceful and thoughtful verses. Many of them have already appeared in the chief magazines of the day. But we think Miss Layard has done right in collecting them together in this pretty form. They are too good to pass away with the monthly ephemeral literature. They are full of thoughtful and philosophical feeling expressed with that delicate *nuance* which only an educated woman possesses. Every reader of SCIENCE-GOSSIP should procure or read these poems.

The Philosophy of Clothing, by W. Mattieu Williams (London: Thos. Laurie). There are few writers on economic or general science better known than Mr. Mattieu Williams. His monthly contributions to our own columns convinced us of this. Consequently, whatever he has to write or speak upon is bound to be read and heard. In this well got-up little book Mr. Williams discourses like the practical philosopher he has proved himself to be, and even illustrates his remarks by the peculiar type in which his remarks are set up. He treats upon "Our Natural Clothing" (an admirable chapter to read), "The Natural Relations of Animal Heat," "The Protecting Power of Different Clothing Materials," "The Transmission of Heat through Clothing," "Adhesion of Air to Clothing Materials," "Clothing as a Sanitary Purifier," "Woollen Clothing" (illustrated by specimens of the same), "The Sebaceous Follicles—Feather Clothing," "Boots and Shoes," "Head Gear," "Women's Dress and Fashion," &c. From the mere titles of these chapters our readers may guess the large scope and amazing amount of practical information conveyed in this little book.

Are the Effects of Use and Disuse Inherited? By W. Platt Ball (London: Macmillan & Co.). This well got-up little volume is one of the celebrated "Nature Series." It deals clearly and forcibly with Herbert Spencer's examples and arguments, as well as those of Charles Darwin. The ground travelled over by the author is far-reaching, and the subjects treated upon numerous and varied.

An Illustrated Handbook of British Dragon-flies, by the editor of the "Naturalist's Gazette" (London: E. W. Allen; Birmingham: The Naturalist Publishing Co.). This capital little handbook is just the work which has long been wanted by students. The author has devoted special attention for years to this class of insects, and he now gives, in a cheap form, the benefits of his knowledge and experience. We cordially recommend the book.

Inorganic Chemistry, by J. Oakley Buttler (London: Relfe Bros.). This is a handy and useful little book on the chemistry of the non-metals. It covers the ground required by the London Matriculation Examination, as well as the Cambridge Local Examining Board, and the Science and Art Department.

Practical Inorganic Chemistry (elementary stage), by E. J. Cox (London: Percival & Co.). Another competitor for the much patronised "student" going in for the Science and Art Department, &c., written by a man who knows his work. It is, however, a cheap, handy, and capital note-book, just small enough to be useful (51 pages), and the limp cloth cover makes it handy for the pocket.

SCIENCE-GOSSIP.

ROYAL INSTITUTION.—The following are the Lecture Arrangements before Easter: Professor Dewar, Six Christmas Lectures to Juveniles, on Frost and Fire; Professor Victor Horsley, Nine Lectures on the Structure and Functions of the Nervous System (Part I. the Spinal Cord, and Ganglia); Mr. Hall Caine, Three Lectures on The Little Manx Nation; Professor C. Hubert H. Parry, Three Lectures on the Position of Lulli, Purcell, and Scarlatti in the History of the Opera; Professor C. Meymott Tidy, Three Lectures on Modern Chemistry in relation to Sanitation; Mr. W. Martin Conway, Three Lectures on Pre-Greek Schools of Art; the Right Hon. Lord Rayleigh, Six Lectures on the Forces of Cohesion. The Friday evening meetings will begin on January 23rd, when a discourse will be given by the Right Hon. Lord Rayleigh on Some Applications of Photography; succeeding Discourses will probably be given by the Right Hon. Lord Justice Sir Edward Fry, Professor J. W. Judd, Professor A. Schuster, Dr. E. E. Klein, Mr. Percy Fitzgerald, Dr. J. A. Fleming, Dr. Felix Semon, Professor W. E. Ayrton, and other gentlemen.

WE have received a reprint (Part 3) of a paper by Dr. A. B. Griffiths, on his "Researches on Micro-Organisms." It is a bit of excellent and original work.

THE first part of a most thoughtful and suggestive paper appeared in the "American Naturalist" for October on "The Evolution of Mind," by Professor Cope.

THE Third Part of M. Tempere's "Le Diatomiste" fully keeps up its high character. The photographic enlargements are a high work of art.

WE recommend our geological and entomological readers to study the paper in the December issue of the "Annals and Magazine of Natural History" on "The Fauna of Amber," by Herr Richard Klebs, of Königsberg.

WE are pleased to see that a new edition (the third) of Dr. E. Crookshank's "Manual of Bacteriology," revised throughout, has just been issued.

AT length the great Darwinian, Dr. A. R. Wallace, has received recognition at the hands of our Royal Society. He has obtained the first Darwinian gold medal. But why is he not an F.R.S.?

DR. HENRY WOODWARD figures and describes in the December number of "The Geological Magazine" a new Fossil British Isopod, discovered by Mr. Thomas Jesson in the great Oolite of Northamptonshire.

THE number of known small planets has now reached three hundred. Of these, thirteen were discovered last year. The first was discovered at the beginning of the century.

WE have received from Mr. John Dennant, F.G.S., an enthusiastic Victorian Geologist, a reprint of his valuable paper entitled "Observations on the Tertiary and post-Tertiary Geology of South-Western Victoria."

MR. MONTAGU BROWN has published, in the "Transactions of the Leicester Literary and Philosophical Society," an important paper on a "Revision of a Genus of Fossil Fishes, *Dapedius*."

WE beg to acknowledge the reprint of an important paper by Dr. C. A. Oliver, Ophthalmic-surgeon to St. Agnes's Hospital, Philadelphia, on "An Analysis of the Motor Symptoms and Conditions of the Ocular Apparatus as observed in Imbecility, Epilepsy, and the second stage of General Paralysis of the Insane."

MR. C. J. GILBERT'S pamphlet on "The Geology of Sutton-Coldfield" is an important addition to the geology of the Midland Counties. Mr. Gilbert has studied the locality, and done the work well.

"ELECTRICITY IN DAILY LIFE," by F. B. Lea, is a very cheap (twopence) pamphlet published by E. W. Allen, to which we are pleased to draw attention.

THE sixth and seventh parts of Mr. R. L. Wallace's work on "British Cage Birds" are well up to the high standard gained by the preceding numbers.

BOOK-BUYERS will find Mr. Edward Stanford's recently issued "Catalogue of Maps, Atlases, and Books" exceedingly useful.

"THE NATURALIST'S ANNUAL AND DIRECTORY FOR 1891" is a happy thought. The present first beginning, however, is capable of considerable extension.

WE have received a reprint of Mr. G. W. Bulman's important paper on "A Coal-Seam in the Bernician Series of Northumberland, and its Bearing on the Theory of the Formation of Coal." Mr. Bulman, as our readers know, is a thoughtful and original writer.

WE gather that a series of pamphlets on "Every-day Science" is being issued from Curtis and Beamish, of Coventry. The first to hand is one on "The Philosophy of Cycling," by W. R. Fulleyrove.

THE Rev J. E. Kelsall's carefully-annotated list of the birds of Hampshire and Isle of Wight has been reprinted, price one shilling (Southampton: the "Independent" office).

DR. G. J. HINDE has kindly forwarded a reprint of his paper from the "Annals and Magazines of Natural History," on "Radiolaria from the Lower Palæozoic Rocks of the South of Scotland." We have few more ardent palæontological workers than Dr. Hinde.

ONE of our well-known correspondents, the Rev. H. W. Lett, sends us a reprint of his painstaking and lengthy report (about 60 pp.) on "The Mosses, Hepatics, and Lichens of the Mourne Mountain District." It originally appeared in the "Proceedings of the Royal Irish Academy."

MESSRS. GEORGE PHILIP & SON, 32 Fleet Street, are exhibiting a very large and complete Tellurium, constructed for lecture-purposes, which illustrates the complex motions of the earth and moon. It shows the actual position of the earth in space for any given time of the year.

THE "Transactions of the Wagner Free Institute of Science of Philadelphia" contains a splendidly-illustrated monograph, by W. H. Dall (Palæontologist to the U.S. Geological Survey) entitled "Contributions to the Tertiary Fauna of Florida, with Especial Reference to the Silex-Beds of Tampa, and the Pliocene-Beds of the Caloosahahatcie River."

MICROSCOPY.

THE VERTICAL CAMERA.—I have very recently received a vertical camera from one of the leading London firms, and am working myself towards a solution of the difficulties it presents to me. I find that when the image is projected on paper laid on the table in front of the microscope there is considerable distortion. The circular valve of a diatom (under a one-sixth objective) is projected as an ellipse (Fig. 5*a*). To remedy this, I have made a small sloping drawing-desk of deal wood, the upper surface of which is 10 inches square, and is fixed at an angle of 45°. The image of the same diatom projected on

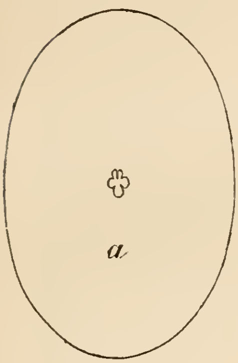

Fig 5.

Fig. 6.

the inclined surface of the slope is, as it should be, a circle, Fig. 6*b*. It is quite possible that this is the usual way in which the distortion I refer to is rectified; but as none of the illustrated descriptive catalogues and journals to which I have referred suggest the use of a slope, this little note may be useful to those who, like myself, have to think matters out for themselves. Will any of your readers who work with vertical cameras give a few "tips" in your columns on the best way of using this appliance?—*W. J. Simmons, Calcutta.*

ZOOLOGY.

THE GREAT GREY SHRIKE.—I find there are no authentic instances of this bird breeding in this country. The last week in May, 1889, a great grey shrike was given to me that was shot at Brackley. The bird had all the appearance of being a brooding-bird, and the fact of it being found so late in the season almost proves that it does occasionally breed in this country.—*H. Blaby.*

SHELLS IN BANFFSHIRE.—I append a short list of shells found during two rambles last October, at Aberlour, Banffshire. This granite country yields few shells, many only being found near walls and rubbish heaps, where more mortar has been used or deposited. I was unable to make a thorough search for fresh-water specimens. *Unio margaritifer*, *Anodonta cynæa*, from the river Spey; *Limnæa peregra*, frequent; *Vitrina pellucida*, very common; *Zonites parvus*, var. *margaritacea*, scarce; *Z. fulvus*, moderately common; *Z. nitidus*, common; *Helix lamellata*, one only; *H. hortensis*, scarce; *H. nemoralis*, moderately common; *Clausilia rugosa*, scarce. These seem to approach the var. *tumidula*, being smaller and more ventricose. *Vertigo edentata*, more common than any of the above.—*J. Chas. Smith, Penrith.*

DISEASE IN ROOK.—On Sunday Nov. 16th I found a rook in a ditch near the Vicarage. Whenever it tried to walk it rolled over and over. I brought it home and put it in a room till after morning-service was over; then I took it some juicy beef cut in small pieces. Whenever it attempted to swallow it could only throw its head forward, and of course threw the meat out of its bill. I noticed that it could walk backward quite well, but whenever it tried to walk any other way it rolled over. I gave it over to a bird-stuffer next day, Nov. 17th, and he found that although dead less than twenty-four hours—for I wrung its neck—the liver was completely rotten. There were no marks of any wound or injury. The feathers were smooth and glossy, but the bird was very light in weight.—*R. Ashington Bullen.*

"PROCEEDINGS," ETC., OF COLONIAL AND PROVINCIAL SOCIETIES:—

THE best token we could adduce of the scientific research and love thereof in our Australian colonies will be best demonstrated by the following "Contents" of the last issued "Journal of the Royal Society of New South Wales":—"List of the Marine and Fresh-water Invertebrate Fauna of Port Jackson and the Neighbourhood," by Thos. Whitelegge; "The Analysis of the Prickly Pear," by W. H. Hamlet; "Notes on New South Wales Minerals," by C. H. Mingaye; "Notes on Goulbourn Lime," by E. C. Manfred; "The Australian Aborigines," by the Rev. John Mathew; "Aids to Sanitation in Unsewered Districts," by J. A. Thompson; "Well and River Waters of New South Wales," by W. A. Dixon; "The Aborigines of Australia," by Ed. Stephens; "New South Wales as a Health Resort in Phthisis Pulmonalis," by Dr. B. J. Newmarch; besides Reports of lectures, &c.

THE "Proceedings" of the Bristol Naturalists' Society are always full of good matter. The last part contains the following important papers among others:—"The Geology of Tytherington and Grovesend," by Prof. C. L. Morgan; "Flora of the Bristol Coal-Field," by J. W. White; "The Fungi of the Bristol District," by C. Bucknell, Mus. Bac.; "Talpa; or, Remarks on the Habits of the Mole," by C. J. Trusted; "Mimicry among the Lepidoptera," by G. C. Griffiths; "Putrefactive Organisms," by Dr.

Dallinger; "Remarks on Sewerage Systems," by A. P. J. Cotterell; "The Perceptions of Animals," by Prof. C. L. Morgan; "Suggestions as to the Causes of the Difference in Colour between the Flowers and Foliage of Tropical and Temperate Regions," by Charles Jeeks, &c.

BOTANY.

Chlorophyll in Plants.—I have just seen in Science-Gossip an article by J. Ballantyne on the formation of chlorophyll in plants. As I had a similar instance some time ago, I may mention it as appearing to contradict the accepted theory on the subject. I was cutting away some superfluous branches in my melon pit, and found I had cut off one on which was a partly grown fruit. I left it as it was in the frame. It grew (no root) to about twice its then size and ripened. No crack or hole in it to admit the light. Flesh of usual flavour. All the seeds in this fruit had germinated and showed full green cotyledons of such colour as they would have shown if growing in the ordinary way, and of about the size that usually show from the seed case. Is not the law laid down a little too absolutely by some of our (more or less) scientific men in some of these matters? Evidently here are instances in which light has not been instrumental in producing the green colour of vegetation.—*Geo. C. Nervall.*

The Flora of Kent.—Can any reader of Science-Gossip give me information respecting a Flora for Kent, as all my inquiries hitherto have failed in discovering the existence of any such work? It seems very singular that a county so botanically rich as Kent should be so neglected. Does the London Flora take in this district? Also what is the price and when was the last edition published?—*W. B., Plumstead.*

The Evolution of Poisons.—With reference to the note in Science-Gossip for December on the Evolution of Poisons, is it possible that they act in the economy of the plant by being reserves of food matter? Since substances in the seed are absorbed into the young plant, and as numbers of the poisons, etc., are found in the seeds, then why should not similar substance in the plant be reserves for it to use during its growth? Again, the plant might absorb from the soil more than it can use in its economy, and these substances might be a means of getting rid of the surplus. Either of these views would also account for substances which are not poisons, and therefore in that way cannot act as a defence to the plant. The number of these compounds in the vegetable kingdom must be enormous, and this fact might be accounted for by different plants requiring different amounts of elementary constituents, and that each substance is suited to the economy of the plant where it is found. The fact that some of these act as poisons to the higher animals would thus seem to be incidental.—*M. Farrant.*

Euphorbia Cyparissias in Kent.—It was with great pleasure I saw recorded the finding of this plant by a visitor (?) to the neighbourhood. I fear, however, that from the description of the locality, one might search the "hillsides close to Dover" for a long time, and then not find it. However, the description is quite correct. The locality is known to most, if not all, of those interested in botanical matters living in Dover. There are five or six good-sized patches of it, if I remember right. They are so conspicuous when in flower, that they may be seen from the hills on the opposite side of the valley. I had noticed that the botanical books give "woods" as the habitat of this plant. I had also noticed that in Switzerland I have found it anywhere but in woods! Gremli, in his "Flora of Switzerland," gives as habitats, "gravelly places, road-sides, river banks"—and in such places I have found it. I wonder whether K. E. Styan knew, when he was gathering the beautiful little *Cyprus spurge*, that he was within a few yards of a host of rarities and much-sought-after plants? Sixteen or seventeen of our orchids may be found in their season close by—*O. purpurea*, *O. ustulata*, *O. apifera*, *O. muscifera*, *H. bifolia* and *chlorantha*, were all in bloom when K. E. Styan gathered the spurge! It is gratifying to know that a visitor may go into a strange place and find something that the inhabitants know nothing of; and this should encourage all to keep their eyes open. I know of three instances of strangers finding plants unknown to the botanists of the neighbourhood. In 1883 a visitor found near Dover *Habenaria viridis*. In 1888 another visitor found near Folkestone *Ornithopus ebracteatus*; and in 1890 a friend staying for his holidays in the neighbourhood of Dover found two patches of *Phyteuma orbiculare*, and those two patches half a mile apart! One thing to be learnt from this I think is—the desirability of placing upon record all "finds" that strike the finder as good or exceptional, as K. E. Styan has done. One Saturday in June of 1890 I was walking from Sugar-loaf Hill across the fields towards Park Farm, Folkestone, when I was suddenly "brought to" by seeing on the footpath two specimens of the *Cyprus spurge!* How came they there has ever been a mystery to me; they were quite fresh. Does this note of K. E. Styan explain it?—*W. T. Haydon, Wouldham.*

GEOLOGY, &c.

The Geologists' Association.—The last issue of this ever welcome "Proceedings" contains the following papers:—"On the Pleistocene (non-marine) Mollusca of the London District," by B. B. Woodward; "An Account of the Excursion to the South Italian Volcanoes," by Dr. Johnston Lavis; "Concretion in a Yoredale Sand Quarry," by Dr. Hind; "Manufacture of Serpentine in Nature's Laboratory," by Gen McMahon; "A New Species of Capulus," by Professor Boulger; "An Erosion near Stirling," by H. W. Monckton; "The Auriferous Series of Nova Scotia," by Geoffry F. Monckton; "The Pebley Beds on and near the Addington Hills, Surrey," by H. M. Klaasseu; and "Pleistocene Sections in and near London," by W. F. Leevis Abbott.

A Huge Gold Nugget.—At a recent meeting of the Geological Society, a model of the largest gold nugget yet found in Western Australia, known as the "Little Hero," weighing 330 oz. 8 dwts., found at Shaw's Fall, 200 miles from Roebourne, and 80 from Nullagine, at a depth of 8 inches, was exhibited by Mr. Harry Page Woodward, F.G.S.

NOTES AND QUERIES.

The Colouring of Birds' Eggs.—Seeing Mr. Hewett's note on colouring of birds' eggs, though he especially wishes to hear from collectors about guillemots' and razorbills' eggs, I hope my note will not be out of place. In the April issue I sent a letter on a few varieties I had in my collection, and seeing this interesting subject has started again I hope to see other collectors give notes of their varieties, which will be very interesting. In looking over my collection I find three interesting varieties of the lapwing's egg; one a cream colour closely marked at the thick end with jet-black streaks which are very small, another one of a grey or stone colour with faint blotches of light-brown all over. Both specimens are of usual size, but nearer white than the typical colour, and both taken from different nests with full clutch of four. The other specimen is in size and colour similar to the black tern, if any difference a little darker, but really if it had been found in a nest by itself near a locality where the black tern breeds it would, I fear, have been put amongst the rest under the above name. It also was found in a nest with other three, making the usual number found in the lapwing's nest.—*W. D. Rae.*

Small-end Colouring of Sea-birds' Eggs.—Referring to the notes and observations on this subject which have recently appeared in Science-Gossip, I have looked through my collection of over a hundred beautiful and interesting varieties of guillemot's eggs, and find that I have three specimens which are thickly marked at the points or small ends and very sparingly on the other portions. The first is of an almost white ground colour, with a blotch of black on the small end, which extends about an inch from the point all round the egg. There are also a few spots of black scattered over the other part of the egg. The ground colour of another is of a bluish tinge, with a dark zone of different shades of brown and black round the small end and speckled with the same colours on the other part. A third, the ground colour of which is not uniform; part of it is of a decidedly blue hue and the remainder of a bluish green; this egg has a zone of black round the small end. I may mention that I have obtained these varieties in a casual way, never having made a point of procuring "small end" marked specimens. If I have the opportunity next season I will note how many I see at the cliffs and in the climbers' possession of eggs so marked.—*E. G. Potter, York.*

The following flowers have been found in bloom here in December: corn buttercup, hawkweed picris, red campion, common daisy, common mallow, red clover, procumbent speedwell, dark blue speedwell, common feverfew, furze, common nipplewort, creeping cinquefoil, common yarrow, lesser periwinkle, hedge woundwort, creeping crowfoot, upright meadow crowfoot, garlic, black horehound, common chickweed, yellow bedstraw, red dead-nettle, and groundsel.—*H. G. Ward, Northmarston.*

Natural History in January.—January is by no means a dull month in the calendar of nature, for many birds commence singing this month. The song-thrush sings sweetly from the top of some tall tree, while the skylarks are singing joyously overhead. The hedge-sparrow, robin, and great-tit all charm us with their music, and sometimes, too, if the weather is mild, we may hear the long-drawn but pleasant notes of the chaffinch. In the gardens, snowdrops, primroses, garden daisies (red and white), hepaticas (red and blue), gillies, the yellow globe flower, and red and brown oxlips may be found in flower this month. In the corn-fields and meadows we may find red dead-nettle, procumbent speedwell, groundsel, pansy, shepherd's purse, dandelion, white dead-nettle, chickweed, and a few daisies. The bat comes stealing out in the dusk of evening as the days get longer. The fieldfares, redwings and starlings frequent the meadows in large flocks, and in mild weather, when the ground is moist, they find an abundance of food.—*H. G. Ward.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which now come to us from Devonshire to appear unless as advertisements.

J. Capell.—The shells you sent are all rightly named except No. 2, which is *Planorbis carinatus*, not *P. vivipara*—the latter is very much larger. The fungus on leaf of sweet William is *Puccinia lychnidearum.*

T. S. A.—Get Dr. Cooke's recently published work on "British Freshwater Algæ," price 5*s.*—one of the International Scientific Series.

A. T.—Richard Jefferies's books can be obtained of Messrs. Chatto and Windus.

R. S.—There is a capital little hand-book to the geology of Derbyshire, by the Rev. J. Mello, with geological map. Apply to some Derby bookseller.

P. F.—Yes, the "Young Collector" series is both cheap, well got-up, and trustworthy. You cannot do better.

EXCHANGES.

Wanted, an injecting syringe and a Valentin's knife.—H. P., 103 Camden Street, London, N.W.

Offered, 1 golden-crested wren, 2 bullfinches, 2 chaffinches, 2 moorhens, 2 magpies, 1 long-tailed tit, all side-blown, one hole, in exchange for 1 coot, 1 common heron, 1 wild duck, 1 partridge. Will exchange singly.—C. D. Heginbothom, Patwell House, Bruton, Somerset.

Oldhamia antiqua and *O. radiata*, Cambrian rocks, Bray Head. What offers in minerals or fossils for the above?—William Doyle, Seapoint Road, Bray, Ireland.

SHELLS.—*Pecten maximus, P. tigrinus, P. opercularis, Lasæa rubra, Lucina spinifera, Cyprina islandica, Astarte triangularis, Venus exoleta, V. lincta, Tapes virgineus, Tectura testudinalis, Trochus montacuti, T. tumidus, T. milligranus, T. Ziziphinus, Rissoa membranacea, R. fulgida, R. cingillus, R. violacea, Hydrobia ulvæ, H. ventrosa, Natica montacuti, N. alderi, Trichotropsis borealis, Cerithopsis tubercularis, Murex erinaceus, Defrancia linearis,* and *Pleurotoma turricula*. Also land and freshwater shells in exchange for micro-slides, insects, shells not in collection, or books on any of the above subjects, or what offers?—W. D. Rae, 9 Claremont Terrace, Alpha Road, Millwall, London, E.

OFFERED, SCIENCE-GOSSIP for 1885, and January to April, 1886; "Entomological Magazine," June, 1885, to April, 1886; "The Entomologist," 1885 (bound). Wanted, birds' eggs.—O. Weiss, 87 Hasborne Road, Birmingham.

$\frac{1}{15}$ WATER immersion of R. and J. Beck, cost 8*l*., nearly new (180° N.A. 1·05); a splendid lens. What offers?—E. Wagstaff, 3 Waterworks Road, Edgbaston, Birmingham.

AMERICAN lepidoptera, and cocoons and chrysalids of same. American birds' eggs and Indian relics offered for exotic lepidoptera other than European. S. American, African, and Australian especially desired.—Levi W. Mengel, Reading, Penna.

WANTED, any books relating to microscopy, also good unmounted material, in exchange for choice microscopic slides of every description.—R. Suter, 5 Highweek Road, Tottenham.

DUPLICATE copy of Christy's "Birds of Essex" (just published, demy 8vo., price 15*s*.), offered in exchange for any other similar county ornithology.—W. W. Porteous, Saffron Walden.

TEXT-BOOKS for Intermediate Science (London), offered in exchange for magic-lantern, slides, or text-books on geology, mathematics, or mental and moral science. For list apply to—"Magister," 8 Venetia Road, Finsbury Park, N.

Planorbis corneus, var. *albida, Vertigo pygmæa, Balia perversa*, &c., and first-class microscopic slides. Wanted, *Vertigo alpestris*, and other British and foreign land and freshwater shells.—William Moss, 13 Milton Place, Ashton-under-Lyne.

I HAVE numerous duplicates in carboniferous fossils, including lepidodendron, sigillaria, neuropteris, sphenopteris, ulodenron, calamites, annularia, posidonia, aviculopecten, and orthoceras. I shall be pleased to make exchanges for chalk or eocene fossils.—W. A. Parker, 634 Market Street, Facit, Rochdale.

FIFTY foreign stamps (no German or English), "Playtime Naturalist" (5*s*. book, quite new), "Works of Mrs. Hemans" (5*s*. book, quite new). What offers in exchange for any of the above?—Richd. B. Corbishley, Poulton-le-Fylde, Lancs.

FOR exchange, good fossils from millstone grit of following genus, all named and localized: productus, bakevellia, gervillia, orthis, natica, bellerophon, schizodus. Also from Yoredale shales, *Gonatites reticulatus*. Wanted, fossils from Silurian, Ordovician, Cambrian. Send lists to—W. F. Holroyd, Greenfield, near Oldham.

WILL any collector of fossils, who has named duplicates to spare, kindly send them to a small local museum now being formed? Address—A. L. D., The Vicarage, Southboro, Tunbridge Wells.

SCIENCE-GOSSIP for 1889, "Naturalists' Gazette," 1889–90, "Field Club," 1890, unbound, good condition. What offers in natural history?—W. Turnbull, 1 Horne Terrace, Edinburgh.

HEADS of mummy cats, in very good preservation. Desiderata, foreign sponges, echinidæ, crustacea, or insects.—C. Walker, Mossy Bank, Egremont, Cheshire.

SEVEN hundred species of shells for exchange. Exotic land shells particularly desired. Lists exchanged.—W. Bendall, 28 Gloucester Place, Portman Square, W.

AUSTRALIAN plants, New Zealand ferns, mosses, lichens, shells, and packets of micro material, with references to published papers in which the deposits are described, offered in exchange for foreign land and freshwater shells not in collection, or works on conchology.—W. A. Gain, Tuxford, Newark.

WANTED, side-blown eggs of sparrow-hawk, kestrel, landrail, and many others, in exchange for rare eggs.—Jas. Ellison, Stecton, Keighley.

WANTED, fossils from various localities; a large number of good duplicates offered in exchange.—Thomas W. Reader, 171 Hemingfoad Road, London, N.

OFFERED, "Science for All," 5 vols. (unbound), Fullom's "Marvels of Science," "Text-Book of Mineralogy," and Professor Geikie's "Text-Book of Geology," &c., in exchange for British land and freshwater mollusca not in collection. Send list to—E. H. J. Baldock, 67 Brewer Street, Woolwich.

SHELLS from Red Crag.—*Astarte omalii, Cardita planicosta, cardiums, Cyrena cunuformis, Natica clausa, pectens, Trophon clathratum, Fusus contrarius* and *antiquus, Nassa reticosa, Purpura reticosa*. Wanted, fossils from chalk, gault, Weald clay, and Tunbridge Wells sands.—Curator, Oakfield, Southborough, Tunbridge Wells.

DUPLICATES.—*Sophina calias, Streptaxis Blanfordi, S. Theobaldi, S. Burmanica, S. bombax, S. exacutus; Clausilia Waageni, C. Theobaldi, C. insignis, C. Gouldiana, C. cylindrica; Helicarion Flemingii, Cataulus albescens, Raphaulus chrysalis, Hybocystis gravida, Cyclophorus Siamensis, C. speciosus*. List of many others. Desiderata, Indian and South American land shells.—Miss Linter, Arragon Close, Twickenham.

WANTED, a good copy of Davidson's "Silurian Brachiopoda," "Annals and Magazine of Natural History," series 5, vol. iii., and any papers on the graptolites.—J. Bickeston Morgan, Welshpool.

WANTED, about a tablespoonful of sand rich in microscopic shells, forams, &c., also dried leaves of *Onosma taurica*, and frond of *Davallia canariensis* showing fructification.—H. Ebbage, Framlingham, Suffolk.

OFFERS wanted for 13 vols. of SCIENCE-GOSSIP, 1875–1887, bound in publisher's blue cloth, in good condition. Address—H. Muller, Mottingham, Eltham, Kent.

SIDE-BLOWN eggs of whinchat, sedge, garden and willow warblers, tree and meadow pipits, skylark, reed bunting, great titmouse, bullfinch, rook, jackdaw, swallow, sandmartin, ringdove and lapwing for exchange. Offers to—R. Larder, 33 Mercer Row, Louth, Lincs.

SCIENCE-GOSSIP (1885–89) in exchange for perfect microslides or recent text-books—list first.—W. E. Watkins, 32 Huntingdon Street, Barnsbury, N.

WANTED, a petrological microscope, with or without accessories, by Swift or Crouch. Particulars to—Micro, 8 Tothill Street, S.W.

WANTED, *M. pellucida, incurva, H. ventrosa, P. fontinale, Pl. dilatus, A. lacustris*, &c. Offered, *P. contecta, P. corneus*, and many other British land, freshwater and marine shells.—W. T. Pearce, 101 Mayfield Road, Seafield, Gosport.

"MAGAZINE of Natural History," conducted by Loudon and Charlesworth, 1829–1840, 13 vols., half-calf, Hooker's "Student's British Flora," "Naturalist," vol. v., 1879–1880, entomological collecting box, japanned tin, 11½ inches by 8 inches, hardly used, in exchange for works on natural history, Herbert's "Amaryllidaceæ," or offers.—Rev. W. W. Flemyng, Clonegam Rectory, Portlaw, co. Waterford.

WANTED, foreign worms, living or in spirits, in exchange for British earthworms correctly named (including *Allurus tetrædrus, Allolobophora chlorotica, Lumbricus rubellus*, the Brandling and others); sent alive or preserved.—Rev. Hilderic Friend, F.L.S., Idle, Bradford.

BOOKS, ETC., RECEIVED.

"The Autobiography of the Earth," by the Rev. H. N. Hutchinson (London: Edward Stanford). — "Fresh-Water Aquaria," by the Rev. Gregory C. Bateman.—"Poems," by Nina F. Layard.—"Applied Geography," by J. Scott Kettie (London: Geo. Philip & Son).—"Soap Bubbles," by C. V. Boys; and "Spinning-Tops," by J. Perry (London: S.P.C.K.).—"Pasteur and Rabies," by T. M. Doulon (London: G. Bell & Sons).—"Sound, Light, and Heat," by J. Spencer (London: Percival & Co.).—"Electro-Motors," by S. R. Battone (London: Whittaker & Co.).—"Metal Turning," by a Foreman Pattern Maker (London: Whittaker & Co.).—"The Natural Food of Man," by Emmet Densmore (London: Pewtress & Co.).—"The Electric Light Popularly Explained," by A. Bromley Holmes (London: Bemrose & Sons).—"Fathers of Biology," by Chas. McRae (London: Percival & Co.).—"The Canary Book," Part 8.—"British Cage Birds," Part 8.—"Researches on Micro-Organisms," by Dr. A. M. Griffiths (London: Baillière, Tindal & Cox).—"The Darwinian Theory of the Origin of Species," by F. P. Pascoe (London: Gurney & Jackson).—"The Geology of Barbadoes," by J. B. Harrison and A. J. Jukes-Brown.—"Ocular Symptons found in Paralysis of the Insane," by Dr. C. A. Otwer.—"The Essex Naturalist," July to September.—Wesley's "Nat. Hist. and Scientific Book Circular," No. 105.—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Nature Notes."—"Proceedings of the Geologists' Association."—"The Philosophy of Cycling."—"Proceedings of the Bristol Naturalists' Society."—"Transactions of the Penzance Nat. Hist. and Antiquarian Society."—"The Naturalist's Annual and Directory for 1891."—"Journal and Proceedings of the Royal Society of New South Wales."—"British Cage Birds," Part 7.—"Electricity in Every-Day Life."—"Insect Life," Nos. 2 and 3.—"Revision of a Genus of Fossil Fishes, *Dapedius*."—"The Geology of Sutton Coldfield," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 14TH ULT. FROM: C. D. H.—F. A. L.—H. B.—J. E. L.—H. P.—E. W.—O. A. W.—W. D. R.—W. D.—W. T.—Miss L.—E. H. J. B.—J. W. R.—J. B. M.—W. A. G.—W. J. S.—J. E.—E. G. P.—W. B.—E. B.—Dr. G. T. C. M.—C. W.—F. C. M.—L. W. M.—J. C. S.—R. S.—H. D.—W. W. P.—W. M.—W. A. P.—W. B.—R. A. B.—J. B. C.—A. B. G.—W. E. W. W. T. P.—G. H.—H. M.—H. G. W.—W. W. F.—W. T. H.—H. W.—Dr. A. O.—A. B. G.—A. E. S.—R. B. C.—V. A. L.—C. W. P.—&c., &c.

TWO SIDES OF THE MEDAL.

By ALICE BODINGTON.

IN employing a metaphor drawn from common life to illustrate the curious tendency of the human mind to look only at one side of a question, I take refuge behind the great name of Mr. Herbert Spencer, who drives home some of his weightiest arguments by the help of familiar metaphors.

We will suppose a medal struck in memory of some great event in the history of a nation. On the one side is represented a figure of the country; on the other a fleet in full sail. What should we say if two opposing schools arose, one of whom vehemently maintained that the medal represented a female figure, whilst the other as stoutly contended that it represented a fleet? Should we not feel inclined to exclaim, "A plague o' both your houses!" and request the disputants to look at both sides of the medal? Yet, notwithstanding the incredible progress attained by physical science through steady adherence to the principles of inductive reasoning, there seems some weakness of the human mind which leads it constantly into the old vicious methods of *à priori* argument. People do not now sit down and proceed to construct a scheme of the universe out of their own inner consciousness, and make all facts fit into a bed of Procrustes, as was the cheerful custom with philosophers of old. But, whilst appearing to follow the inductive method with sedulous care, there is too often a fatal bias in the thinker's mind, which places everything which makes for his theory in a bright light, and obscures, or wholly blots out, all evidence that goes against it. In many cases, perhaps in most, the thinker is not aware of his bias, but, as Darwin says in one of his letters, "Nearly all men past a moderate age, whether in years or in mind, are, I am firmly convinced, incapable of looking at facts from a new point of view.' And for this reason he "thinks it of importance" that intelligent men who are not naturalists should read his book, because he "thinks such men will drag after them those naturalists whose ideas are fixed." In reading Mr. Wallace's "Darwinism," I have been forcibly reminded again and again of the words just quoted. Mr. Wallace, one of the few still left to us of a generation of great men, has had the happy fortune to inspire, in those who only know him through his works, not only high esteem but affection. High esteem for the quiet magnanimity with which he accorded to Darwin the victor's wreath he might have aspired to wear himself; affection, for the kindness of heart his works constantly betray—a kindness of heart which shrinks from seeing that "Nature, red in tooth and claw," of whose existence most of us are painfully aware. But, notwithstanding the sentiments of affection and esteem which are inspired by the name of Mr. Wallace, it is impossible to avoid the conclusion that his mind is hardly, if at all, influenced by the discoveries of the last quarter of a century. It is true that he alludes to some of these, but in a very cursory way, as though hardly worthy of attention or of argument. He believes in natural selection pure and simple, with its odd theory of constant variations occurring for no reason, and owing their origin to nothing in particular. Moreover, these erratic variations must occur of their own accord in successive generations, because he can find no satisfactory evidence of use or disuse of parts being inherited! Nor, though he admits that changes in individuals take place through the action of the environment, he will not admit that these changes are inherited! Yet he believes in changes in breeds of domestic animals through "selection." How can selection act, if there is no inherent force to initiate the change? If individual peculiarities are inherited, then it is quite natural that a pointer puppy should point; but if they are not, why should he not accidentally vary in some other direction? There must be some internal force rendering variation possible, or the breeder might select for ever without producing any effect. Practically, in every-day life every one acts upon the assumption that individual peculiarities are transmitted, with or without selection. Defects of body and mind, and liability to succumb to certain diseases, are also only too well known to be transmissible from one generation to another. Deaf-mutes have children who are deaf-mutes, though atavism hinders all the children from inheriting this defect; and the same remark applies to persons with supernumerary toes and fingers. Where one parent has been the victim of phthisis or of insanity, the children are in danger of succumbing to the same disease; where both parents have fallen victims, the chances are increased to a frightful degree. It is almost impossible to imagine how the strongest prepossessions against heredity can hold out in the face, not only of countless arguments from science, but of the practical experience of mankind in all ages.

Mr. Wallace devotes one chapter only to the geological evidence of evolution; but even in the very brief sketch he gives, there appears such overwhelming evidence of the influence of heredity and its effects in perfecting or aborting every organ of animals, and the slight, fine modifications in certain directions by which the changes from fossil to existing species have been effected, that one thinks he cannot remain unconvinced, and that he must believe these modifications to be hereditary. We almost doubt the evidence of our eyes when we read this passage, "There is now much reason to believe that the supposed inheritance of acquired modifications—that is of the effects of use and disuse, or of the direct action of the environment—is not a fact." That is, we are to believe that all the modifications leading steadily upwards or downwards, the limbs perfected for speed of the horse and deer, the utter absence of limbs in certain lizards, the specialisation of the dentition of animals varying cusp by cusp and tooth by tooth, the improvement in brain capacity from Eocene times to our own, the persistence of rudimentary organs not only useless but dangerous to their present possessors; we are gravely asked to believe that all these modifications are the result of a series of accidents occurring generation after generation with results more and more marked, yet all uninherited and accidental! Can any one who has been impressed with the grand simplicity and uniformity of the great Laws of Nature, believe that evolution is due to an infinite number of happy accidents? We know of a law which answers all those requirements of simplicity and uniformity of a great Law of Nature, which is in harmony with all the apparently complicated phenomena of life, which solves problems otherwise insoluble, the Law of the Action of the Environment upon Irritable Protoplasm. And we are asked to set it aside as non-existent, and believe in innumerable accidental variations, as an efficient substitute!

Mr. Wallace refers, with high approval, to Professor Weismann's now celebrated lectures. If the theory which Professor Weismann considers he has proved in his laboratory is contradicted by the evidence of zoologists and paleontologists, as well as by the universal practical experience of mankind, then it is clear that laboratory work will not explain everything, and that the methods employed have been erroneous. But what shall we say when we are asked to accept a theory of which there is not one iota of tangible proof, which is, if anything, entirely contradicted by facts, and to accept this hypothesis as the only side of the medal? Professor Weismann's theory in brief is that the "substance which forms the foundation of all the phenomena of heredity, in my opinion, can only be the substance of the germ-cells, and this substance transfers its hereditary tendencies from generation to generation, and is always uninfluenced in any corresponding manner by that which happens in the lifetime of the individual. If these views be correct, all our ideas upon the transformation of species require thorough modification, for the whole principle of evolution by means of exercise (use and disuse) as proposed by Lamarck, and accepted in some eases by Darwin, entirely collapses."*

When we read that views held not only by Lamarck, but by a host of illustrious men of science who have evidence at their command, which Lamarck and Darwin would have given worlds to possess, are to collapse before a certain theory, we expect this theory to have been founded on something that has at least been seen and observed. But it turns out that everything has to be "assumed." The assumption is that only a part of the germ-cell is used in the formation of the future animal; the remainder of the cell as "germ-plasm" is reserved to be handed on to future generations. I have endeavoured to reproduce this idea by a rough diagram.

"The germ cells † are not derived at all, so far as their essential substance is concerned, from the body of the individual, but they are derived directly from the parent germ-cell." The body (somatic) cells have, Prof. Weismann repeatedly declares, nothing whatever to do with the production of the germ-plasm.

* "Biological Memoirs," p. 69. † Ibid. p. 168.

Yet he goes on to say that in all cases but that of the Diptera,* "generative cells arise from some of the later embryonic cells, and as these belong to a more advanced ontogenetic stage in the development of the idioplasm,† we can only conclude that continuity is maintained by assuming, as I do, that a small part of the germ-plasm remains unchanged during the division of the first segmentation nucleus, and remains mixed with the idioplasm of a certain series of cells, and that the formation of true germ-cells is brought about at a certain point in the series by the appearance of cells in which the germ-plasm becomes predominant. But if we accept this *hypothesis, it does not matter theoretically*" [the italics are mine] "whether the germ-plasm becomes predominant in the third, tenth, hundredth or millionth generation of cells." In the same way, when we are dealing with imaginary fortunes, it does not matter whether we endow our hero with a thousand pounds a year or a million. We seem landed in the happy old days when one philosopher derived everything from fire, and another derived everything from water, and one hypothesis did just as well as another theoretically. The germ-plasm, which governs heredity, may exist or it may not; nobody has seen it, nor is likely to see it unless the laws of optics change. Something conveys hereditary tendencies in a mannor as extraordinary as it is mysterious. The hermaphrodite worm, which, if ontogeny does not deceive us, was the ancestor of the vertebrata, has impressed his nature upon all of us in the form of innumerable embryonic and rudimentary structures.‡

Prof. Weismann may be perfectly correct so far as he maintains that heredity is the work of his germ-plasm, and the manner in which he works out this part of his theory is delightful. It is when he claims that variability is also the characteristic of his imaginary substance, to the exclusion of any influence exerted by the somatic cells, that one refuses to accept theory in place of facts. He will look only at his own side of the medal, though he appears sincerely to wish to look at the other as well. Eyes do not atrophy through disuse; short sight is not inherited; a pointer doesn't point because his ancestors have been trained to point, but through a predisposition on the part of the germ.§ A predisposition to point on the part of a germ! He denies even the heredity of instinct, and says there is no transmission of acquired skill even in insects! Where facts are so overwhelmingly strong that it is impossible to meet them, he always says "our knowledge on the subject is still very defective." Let us only know more, and the germ will be proved all-potent. In the meantime he complacently says: "The inheritance of acquired characters has never been proved either by means of direct observation or by experiment"! Such an assertion takes one's breath away, and makes one wonder how far a very eminent man can be blinded by a theory.

* "Biological Memoirs," p. 197.
† Called usually germ-plasm.
‡ "Introduction to Lectures on Pathology," by J. Bland Sutton.
§ "Myopia may be attributed to the transmission of an accidental disposition on the part of the germ." Pp. 86, 89, 93, 95.

This fatal tendency to adapt all facts to a foregone conclusion or a pet theory, and to minimise or ignore those that militate against it, the inability or the unwillingness to look at both sides of the medal, is seen in every department of science. The greatest minds have been keenly alive to this danger, and no more illustrious example can be found of devotion to truth at all costs than that of Newton.* His early theories on the law of gravitation were given up by him as untenable, because of difficulties in reconciling this law with the motions of the moon in her orbit. His study of the subject was only resumed after a lapse of eleven years. Yet Newton's original calculations and his theory were perfectly correct, only the original calculations were founded on an erroneous estimate of the length of a degree of latitude on the earth's surface, which had to be corrected before theory and facts could agree. Many of the theories of this illustrious Englishman "were left in an imperfect state, for it is not in matters of science that it is given to the same individual to invent and to bring to perfection. Their complete development required that several subsidiary sciences should be farther advanced." Fortunately no zealous friend was found to treat the conclusions of Newton as final, and dub them 'Newtonism'! The words of Mr. Proctor, just quoted, may most fitly be employed in speaking of the theories of one not less illustrious than Newton; of one not less scrupulously anxious that his theories should be confirmed at all points by facts; yet of one who could not see his grand hypothesis of evolution attain to its full development, because this required that "several subsidiary sciences should be farther advanced." We do not hear of a 'School of Newton,' priding itself on firmly making a stand at the point to which the great philosopher, with the imperfect data at his command, had attained; why in the name of science, or rather of simple common sense, should we hear of anything so absurd as a "Darwinian school." How earnestly would the great master himself have deprecated such an absurdity. His own mind was constantly open to the reception of new ideas. What mattered it to him that some of these ideas threatened to conflict with the brilliant hypothesis, on which much of his fame rested, ie., the development of species through natural selection. All that he cared for—all that he had ever cared for in science, was to ascertain the truth; and again and again in his works he deplores the imperfect data he had to work from. Especially does he deplore the extreme imperfection of the geological record, and it is on

* "Encyclopædia Britannica," articles 'Newton,' p. 441, and 'Astronomy,' p. 756.

this very point that the most gigantic strides have been made in our knowledge of late years.

I will quote a few passages showing the feelings of Darwin on this subject, and how far he was from making a fixed creed of his own conclusions.

"In many cases it is most difficult even to conjecture by what transitions organs have arrived at their present state." *

"In searching for the gradations through which an organ in any species has been perfected, we ought to look exclusively to its lineal progenitors; but this is scarcely ever possible." †

It is hardly necessary to say what brilliant work has elucidated these difficulties of late years. Embryologists have traced the stages through which every part of the future animal passes on its way to its own form of differentiation; as for instance the modifications of the bones in the leg and wing of the chick, in which, at an early period the indications of a former five-toed condition can be seen; the germs of teeth destined never to cut the gum, and the consolidation of the bones in ruminants and equidæ; and the three sets of kidneys in vertebrates.

Palæontologists have had successes as brilliant; they can show the phylogeny of an immense number of our present mammals, whilst the embryologists have demonstrated their ontogeny: the "lineal progenitors" have been found. Darwin says ‡, "Two forms can seldom be connected by intermediate varieties, and thus proved to be the same species, until many specimens are collected from many places; and with fossil species this can rarely be done. We shall perhaps best perceive the improbability of our being able to connect species by numerous fine intermediate fossil links, by asking ourselves whether, for instance, geologists at some future period will be able to prove that our different breeds of cattle, sheep, horses, and dogs are descended from a single stock or from several aboriginal stocks. . . . This could be effected only by his discovering in a fossil state numerous intermediate gradations; and such success is improbable in the highest degree." This success, which the great master thought "improbable in the highest degree" has been attained; and the "numerous, fine, intermediate gradations in the fossil state," have been traced.

Again, in arguing with writers who assert the immutability of species by asserting that geology yields no linking forms, he says,§ "If we take a genus having a score of species, recent and extinct, and destroy four-fifths of them, no one doubts that the remainder will stand much more distinct from each other. . . . What geological research has not revealed is the former existence of infinitely numerous gradations, as fine as existing varieties, connecting together nearly all existing and extinct species. But this ought not to be expected." So far is the great

* "Origin of Species," p. 156. † Ibid. p. 144.
‡ Ibid. p. 279. § Ibid. p. 280.

master from hoping, that before one generation had grown up since his death, these "infinitely numerous variations, as fine as existing varieties," "connecting existing with extinct species"; "these numerous, fine, intermediate fossil links" would be found in countless numbers, and that the ancestral forms not

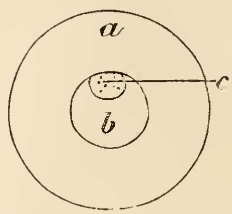

Fig. 7.—*a*, reproductive cell; *b*, nucleus, which after extrusion of the polar globules will form the future animal or plant; *c*, "germ-plasm" left over to carry on the qualities of ancestors, and transferred from generation to generation. Whatever changes occur in an animal are due entirely to modifications of the "germ-plasm."

only of our "different breeds of cattle, sheep, horses and dogs," but those of the bear, the cat, the weasel, the rhinoceros, the camel and of countless other animals would be accurately known.*

And, with regard to his own special hypothesis of evolution through natural selection, he speaks again and again of our ignorance of the causes which have given rise to those variations upon which natural selection has to work. The battle which Darwin had to fight was to prove the evolution and consequent changeability of species, in opposition to opponents who believed in the special creation and unchangeability of species. Having had that great battle won for them, scientific men have had leisure to turn their attention to the cause of the variations controlling evolution. Later in his life, after having borne the burden and heat of the day, Darwin had more leisure to turn his own attention to this most important question. The following extracts will exemplify the earlier and later phases of his opinions on this subject:—"Variations appear to arise from the *same unknown causes* acting on the cerebral organization, which induce slight variations or individual differences in other parts of the body; and *these variations, owing to our ignorance, are often said to arise spontaneously*." † (The italics are mine.) After speaking of the number of facts collected with respect to the transmission of the most trifling, as well as of the most important characters in man, and also in domestic animals, he says: "With regard to the causes of variability, we are in all cases very ignorant." And again, he speaks of the "complex and little-known laws governing the production of varieties," being "the same, so far as we can judge, as the laws which have governed the production of distinct species." ‡

* "Origin of the Fittest" (Professor Cope); "Les Ancêtres de nos Animaux" (Gaudry); "The Mammalia" (Oscar Schmidt.
† "Descent of Man," pp. 38, 110, 111.
‡ "Origin of Species," p. 415.

The last passages I shall quote are pathetic, in view of the persistent attempts to connect Darwin with the narrow, unprogressive school which strives to identify itself with his name. He says: * "It appears that I formerly underrated the frequency and value of these later forms of variation" (viz. adaptive structures which have arisen by the direct action of external conditions). "But as my conclusions have lately been much misrepresented, and it has been stated that I attribute the modification of species exclusively to natural selection, I may be permitted to remark that . . . . I placed in a most conspicuous position the following words: 'I am convinced that natural selection has been the main, but not the exclusive means of modification.' This has been of no avail. Great is the power of steady misrepresentation, but the history of science shows that fortunately this power does not long endure." But his views were gradually changing as to the importance of the action of the environment in evolution; and in one of his later letters he says: "In my opinion the greatest error which I have committed has been not allowing sufficient weight to the direct action of the environment, independently of natural selection." *

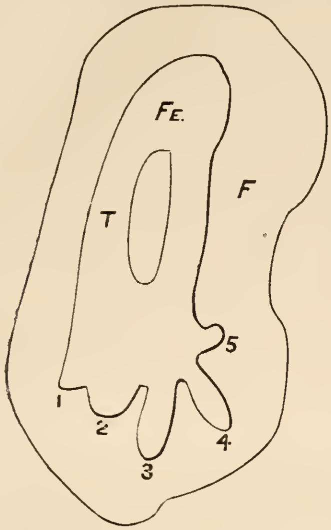

Fig. 8.

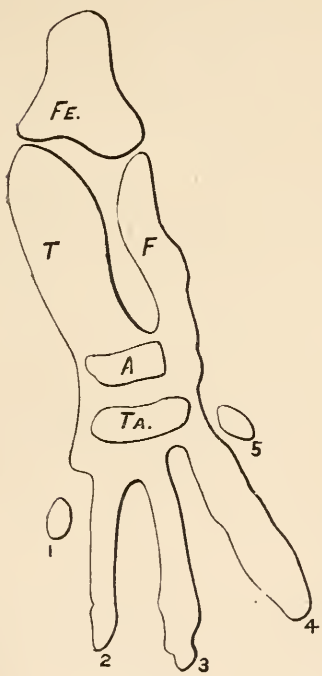

Fig. 9.

Figs. 8 and 9.—Dissection of the Leg of a Chick at the fifth and eighth day of incubation (after Johnson). Fe, femur; T, tibia; F, fibula; A, astragalus (tibiale); Ta, tarsalia. The numerals refer to the digits. (From "Introduction to Lectures on Pathology," by Bland Sutton.)

We have an equally fine instance of the willingness to accept new ideas, however much they might apparently be in opposition to his own views, in the attitude of Mr. Herbert Spencer towards this very theory of natural selection. As early as 1864, in his "Principles of Biology," † with that prophetic instinct which characterises genius, he had laid down those principles of evolution now often spoken of as Neo-Lamarckian. For Lamarck, animated by the same prophetic genius, had foreseen the prepotent power of the action of environment, though his data were so imperfect, so apparently empirical, that his theory was laughed to scorn. Mr. Herbert Spencer had pointed out the influence of the environment on the very simplest unicellular organisms, had traced it up to more and more complex organisms, had shown its influence upon every part of the body and its struggle with atavism, or the principle of heredity so strongly possessed by all animal and vegetable cells. Of the many hundreds of brilliant discoveries in chemistry, pathology, biology, and palæontology, which from every side now confirm his theories, he could not then avail himself; yet his conclusions are confirmed in almost every instance by what these sciences have revealed to us. Yet in his "Factors of Organic Evolution," published twenty-two years later, he is ready to resign his victor's wreath to Darwin, he acknowledges him as a teacher, and bears witness to the priceless services rendered to the cause of the evolutionary theory by the publication of the "Origin of Species." He sees both sides of the medal, but he does not at that date appear to have grasped the fact that each side belongs to the same medal, and that natural selection is only one manifestation of that great Law of the Action of the Environment on all organic beings, of which he was

* "Origin of Species," p. 421 (1872).

* "Life and Letters of Charles Darwin," vol. ii., p. 338.
† "Principles of Biology," pp. 7, 12, 72, 74, 75, 80, 83, 226, 235, 294, 296, 311, 322, &c.

the brillant exponent. In its simplest manifestation it influences the protoplasm of unicellular organisms; in its more complicated manifestations it decrees the extermination of the South Sea Islanders, by the alien civilisation, the diseases, and the rum of the white man. It dwarfs the pines on the tundras of Siberia till they finally dwindle into trailing weeds four to five inches high; it increases the size, or the speed, or the marketable value, whatever it may be, of our domestic animals; it has changed the fierce wolf and the cowardly jackal into the only animal which has won, by its high mental and moral qualities, the title of the friend of man.* It has been proved that the action of the environment, and no mysterious "vital force" preserves the liquid condition of the blood in living veins, or causes its coagulation. No function is too high or too low for its all-pervading influence; just as the law of gravitation acts upon the minutest speck of matter, as inflexibly as it acts upon the solar system.

I trust that in this necessarily imperfect sketch I have at least shown how unjustifiable is the attempt to associate the great name of Darwin with the unprogressive school which arrogates to itself the right of claiming to be his special disciples. To demonstrate fully how baseless in ascertained fact is Professor Weismann's theory of "germ-plasm" would require a special article; but I have endeavoured to indicate a few of its weak points, and to show its constant need of assumptions as bases of reasoning.

* For the ancestry of the dog, see "The Mammalia," by Oscar Schmidt. International Scientific Series.

NOTES ON NEW BOOKS.

Researches on Micro-Organisms, by Dr. A. B. Griffiths (London: Baillière, Tindal, & Cox). Dr. Griffiths is well known as one of the most painstaking and industrious of our younger school of scientists, and he has here produced a very useful manual of reference, which includes an account of all the recent experiments on the destruction of Microbes in various infectious diseases, and is illustrated by fifty-two woodcuts, Just at present Bacteriology is dominant, ten years ago hardly a few scores of people knew what the term meant. A general knowledge of the subject is now incumbent on all medical men, apothecaries, and journalists. Dr. Griffiths, however, does not claim his book to be a manual of Bacteriology, after the manner of Dr. Crookshank. It is rather an exposé of the researches which throw light on the pathology and therapeutics of certain infectious diseases. Nevertheless, it throws a very large cast-net over the whole field of the subject, including an outline of the natural history of Microbes in general; their microscopical examination, classification, cultivation, distribution in earth, air, and water; the various methods of micro-biological research, the nature of various ferments; production of Ptomaines; special ferments; the various substances secreted by Microbes; the action of heat on microbes and their spores; an account of the researches of Koch, Klein, Pasteur, Bert, Parsons, Duclaux, Forster, and others, to which we are pleased to see the author has added his own, which are not the least interesting. There are also lengthy and varied chapters on Germicides and antiparasitic therapeutics; the General Biology of the Microbes of Rabies, Yellow Fever, Pleuro-pneumonia, Foot-and-mouth Disease, Cattle Plague, Pyæmia, Septicœmia, Puerperal Fever, Syphilis-tuberculosis, Anthrax, Swine Fever, &c. The last chapter is an excellent summary of the recent experiments on the destruction of microbes in infectious diseases, in which, of course, those of Professor Koch occupy a prominent position. Dr. Griffiths has produced a useful as well as a thoroughly good book.

Astronomical Lessons, by J. E. Gore (London: Sutton, Drowley, & Co.). We cordially recommend this well got up little book, the work of a well-known astronomer and astronomical writer, as one of the best introductions to the study of the "noble science" we have yet come across. It contains twenty-two short chapters dealing with a large and general range of astronomical knowledge, all of course brought up to the most recent date. The book is well illustrated.

Applied Geography, by J. Scott Keltie (London: George Philip & Son). This is altogether a novel and acceptable departure from the too traditional method of teaching geography. Much of its contents have appeared as articles in leading magazines, lectures given before the Society of Arts, the College of Preceptors, the Bankers' Institute, etc., and the book is illustrated by excellent illustrative maps. It contains five chapters headed as follows:—"Preliminary Considerations," "Geography applied to Commerce," "The Geography of Africa in its Bearings on the Development of the Continent," (two chapters on this all-important subject), "The British Empire," and "Some Common Commodities."

London of the Past, by J. Ashton Ainscough (London: Elliot Stock). This is a small, delightfully written and accurate history of the most wonderful and interesting city in the world. It is a straightforward narrative, neither encumbered with comment nor laden with petty details.

Elementary Treatise on Hydrodynamics and Sound, by A. B. Bassett, F.R.S. (Cambridge: Deighton, Bell & Co.). The author's fame as a mathematician is well known, and his previous works on these special subjects have deservedly acquired for him the rank of an authority. It is a most useful work on mathematical physics, and includes much which will prove valuable to mathematical electricians particularly. We do not known any other manual which so clearly and succinctly deals with the Theory of Sound, in its various departments.

The Electric Light Popularly Explained, by A. Bromley Holmes (London: Bembrose & Sons). This cheap, little, well-written, and easily-understood brochure ought to be in every house in England, and read by every intelligent resident. (Fifth edition.)

Our Fancy Pigeons, by George Ure (London: Elliot Stock). This is an interestingly-written record of fifty years' experiences in pigeon breeding, and the author is a genial and observant naturalist besides. Mr. Ure's name as an authority upon the subject of this book is sufficient to command for it a large circulation.

Metal Turning (London: Whittaker & Co.). One of a valuable series of cheap and practical manuals, well and abundantly illustrated, which will considerably help on the all-important subject of Technical education. It is written by "A Foreman Pattern-Maker," and tells and explains and illustrates to the reader all the particulars of the Lathe, and its various tools.

Electro Motors, by S. R. Bottone (London: Whittaker & Co.). Another of the same series. Mr. Bottone has been in the front of popular and practical teachers and writers on electro-dynamos for ten years past. The brightly got up little manual before us has been prepared by him specially for amateurs as well as practical men.

Magnetism and Electricity, by J. Spencer (London: Percival & Co.). Another addition to the numerous "manuals" written for the over-manualised students of South Kensington, who exist and are tortured for the benefit of "The Department." Mr. Spencer's book is a good one, nevertheless; although we always feel sorry for the over-written "students of South Kensington," wherever they may be.

Sound, Light, and Heat, by J. Spencer (London: Percival & Co.). Another "class-book" for students of South Kensington in the elementary stage. It is of course a good little book, and is written by a man who knows how to teach, and something of the people who have to be taught.

The Darwinian Theory of the Origin of Species, by Francis P. Pascoe (London: Gurney & Jackson). Mr. Pascoe is one of the best literary naturalists of the day, and anything he has to say on subjects like those discussed in this pleasant little book is bound to be listened to. Mr. Pascoe dwells particularly on the fact (which we have been for years maintaining) that Darwinism and evolution are not identical. The former is a minor, the latter is a major term. Darwin discovered and propounded the Doctrine of Natural selection, and many of his too-ardent followers imagined that was sufficient to settle all biological difficulties. But Darwin himself knew better, for he grafted the theory of Sexual Selection upon it. The fact is, Evolution includes not only natural selection, and sexual selection, but perhaps a hundred, a thousand, other active and operative agencies besides. We cordially recommend Mr. Pascoe's book as a valuable contribution to the literature of evolution.

A FEW NOTES CONCERNING COCHINEAL. (*COCCUS CACTI.*)

By H. Durrant.

THIS insect which we use as a dye was supposed, previous to about 1714, to be some kind of a seed, although it was said by Acosta, as early as 1530, to be an insect. However, its real nature is now placed beyond doubt. Mexico is the real home of the cochineal, but it is also cultivated in Teneriffe and several other places. The cochineal we get is about as large as a peppercorn, shrivelled, and of a dark, purplish colour, ovate, convex and transversely furrowed above, smooth beneath. Externally it appears covered with a fine white powder, but when the insect is examined under the microscope, this is resolved into fine hair.

The males do not enjoy a very long spell of life, generally dying when about a month old. Their wings are perfectly white. The females are the only ones of any value, from a commercial point of view. When they have selected the leaf which is to serve them as a habitation, they fix themselves to a leaf by their proboscis and never leave it. There are two varieties of cochineal: the wild kind, called by the Spaniards *Grana sylvestra*, and the cultivated variety, or *Grana fina*, which is greatly superior to the former in regard to the furnishing of colouring matter.

The wild kind is much more downy, though not so large as the cultivated insect, but by cultivation it becomes larger, and loses much of its woolly appearance.

The cochineal feeds on several species of cactus, principally *Cactus cochinellifer* and *Opuntia cochinillifera* (Nopal cactus). It does not, as formerly supposed, derive its colour from the juice of the plant on which it feeds, whose flowers are red, because the insect can be reared upon different species of Opuntia whose flowers are not red.

One of them (*Opuntia cochinillifera*) is cultivated for the purpose in Honduras and Mexico. When the time arrives for the insects to be collected, they are brushed off the trees with the tail of an animal, into bags, and killed by immersing in boiling water. They are then taken out and dried thoroughly in the sun, and put up in serons, or skin bags, for exportation.

The qualities of a good insect, when dried, should be that they are plump and dry. If they are small and have a pink tinge they are least esteemed. The colouring matter of cochineal is carminium, and was first extracted by Pelletier and Caventon by digesting cochineal in ether, treating the residue with boiling alcohol, allowing it to cool, and treating the deposit with pure alcohol; by then adding its own volume of sulphuric ether a deposit of carminium is formed. Carminium is uncrystallisable and of a beautiful red colour; it fuses at 104°. It is soluble in water, but

Fig. 10.—*Opuntia cochinillifera.*

not in sulphuric ether or in essential or fixed oils. Nitric or hydrochloric acid, chlorine and iodine when in a concentrated solution destroy carminium, but when dilute only enhance the brightness of its colour. If alkaline solutions are added to carminium its colour changes to purple. It is precipitated by lime water.

When heated it is decomposed, but yields no ammonia. Cochineal is principally used for dyeing,

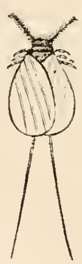

Fig. 11.—*Coccus cacti* (male). Fig. 12.—*Coccus cacti* (female).

and is employed chiefly in woollen goods; the colour is fixed by a mordant of alumina and oxide of tin, and the colour is intensified by super-tartrate of potash. Mixed with white it forms rouge; and the colours, carmine and lake are made from it.

To make a single pound of cochineal it is estimated that no fewer than seventy thousand insects are required. It was once considered an extremely precious article, fetching sometimes as much as 36*s.* and 39*s.* per lb., but the price is now 4*s.*

Previous to 1845 there existed a duty on cochineal, but it is now abolished. It does not lose its properties as a dye by prolonged keeping, if in a dry place. Hellot made some experiments on dried Cochineal which had been kept more than one hundred years, and found their colour as rich as that from those just obtained.

Adulteration is effected by mixing the dried up skins of old, used insects with the genuine article, also by artificially representing them in paste, but they can generally be easily detected.

Another form of adulteration is sometimes practised, and consists in mixing what is known in commerce as "East India Cochineal," and which is a very inferior article with the real.

THE ROMAUNT OF BEDEGAR.

AN AUTOBIOGRAPHY.

By the REV. H. FRIEND, F.L.S.

[*Continued from p.* 11.]

THAT you may see first of all how much attention was formerly paid to my ancestors, I will tell you what one of the old writers on medicine has to say about me. It is true that his language is somewhat dry and uninteresting to many, but, as we all feel a special pride in hearing what people say about us, I may be forgiven if I am somewhat vain of the learned names by which my family has been distinguished. This writer, then, in a brief chapter on *Spina alba*, says it is also known as "*Akantha leuke*, Wood Cyanara (a name which has since been applied to a relative of the thistle family, and is specially associated with the artichoke), Donacitis, Venus' Sceptre (so I understand the name *Erysi sceptrum*, which the names *Frawen Distel* and Mary's Thistle confirm), White Thistle, Royal Thistle, Robber Thistle. In Hebrew it may be called *Atad laban*, that is, *Spina alba*. The German name is White Way-Thistle. This is what the Arabs call Bedeguar; it is also known as the Herb of the House or House-wort,"—I suppose because of the remarkable qualities attributed to certain parts of the plant when employed as a medicine. It should be observed that in the foregoing account of my ancestors the maternal side is especially referred to, since spina and acanthus are both feminine. However, in later times, when people began to think more of the father than of the mother, one Galen adopted the masculine gender for this name, and, when using it as one word, converted it into Leucacanthon. Hence it is that we find this term in very frequent use (not without a good deal of confusion) among more recent authorities on plants. I wish to impress upon my readers at this point the important fact that, so far as we have pursued my family history, every name which my ancestors received—whether Bedegar in Arabic, Acanthus in Greek, Spina in Latin, or Atād in Hebrew, or Distel in German—had reference to the thorny or prickly nature of the original plant. To make this matter quite certain I have fortunately been able to come upon the portrait of one of my grandparents, which was published about three hundred and fifty years ago, or in the early half of the sixteenth century (A.D. 1543) in a valuable old work in Latin. This is a picture of a thistle, with a full and detailed description of its peculiarities. Among other things there stated, I find that my ancestors were fond of hilly and well-wooded regions, bore white leaves, which were narrower and paler than those of the chamæleon, with not a few hairs and prickles. The stem grew to a height of two cubits and more, and the flowers were purple. It is further added that the seeds of this plant (which, it must be remembered, grew amidst a head of cottony hairs or pappus like the seeds of other thistles), were chiefly employed in medicine. Here lies the secret of future mischief and difficulty. It was entirely due to this fact that, after the period we have now reached, a great deal of uncertainty began to be realised when the original Bedegar was asked for. Meanwhile, the name had been spreading, along with the article, far and wide, until alike, in France and England, as well as in Germany, Spain, and other lands, the famous medicine was to be found. I find in a list of herbs which was written six hundred years ago (before books began to be printed) that our name occupies an honourable position. It may interest the reader if I reproduce this early reference. Let it be remembered that medicines were spoken of formerly, as they still are in the East, as hot and cold. Some herbs are mild, or between hot and cold; and in this list of mild plant medicines, three only are named—*Mirtus*, or Sweet Gale, *Arnoglosa*, or the Plantain, and *Bedegar*. The way in which the name is spelt, however, has baffled some investigators, although it may be easily explained. The entry is as follows:—

"BEDEGRAGE.—*Spina alba*, Wit-thorn."

Wit-thorn of course is the same as White Thorn, and simply translates *Spina alba;* which in its turn is a correct equivalent of Bedegar. When this Arabic name became familiar to the Latin writers, they treated it as a Latin word, and declined it as the teacher says, so that sometimes it appeared as Bedegaris; and so it came in time to be written Bedegrage by persons who wrote words according to their sound, without knowing their meaning or history. This curious mode of spelling opened the way for still greater confusion, which was increased by the custom of retaining the Arabic word "Al" (as in algebra, alchemy, alkanet) before names borrowed from that language. Thus I find our family name written in the fifteenth century Albederagi! Who would have thought that Bedegar could be so changed? Yet if we drop the "Al" we shall find the remaining portion (Bederagi) is exactly the same as Bedegrage, with just one letter omitted. This slight change, however, has thrown many a student off his guard, and even in the work which contains the name Albederagi I find a little later on another description of the same thing under the accurately-written name of Bedegar. This confusion of names is, by the way, only a small portion of the confusion which has been introduced in connection with the article itself, as we shall presently see. Let us, however, for a moment follow the names which we used in English and French to set forth the meaning of *Spina alba* or Bedegar to their final resting-place. In France the early translation of the name was *Espine blanche*, the latter word meaning simply "white"; but when *Acantha leuca* and Leucacanthon, *Spina alba* and *Alba spina* came to be confused, the French adopted the term Aubespine, as well as *Espine blanche*, and the English spoke of the Albespyne, or White thorn, meaning no longer the original White-thistle, but the Hawthorn or Maybush! All this is exceedingly curious, and shows what difficulties the genealogist has to encounter and overcome in tracing out the real history of a plant from modern, back to the earliest times.

Having in the foregoing study of my family history shown to what changes the name Bedegar has been liable, and to what different ideas its translation into other tongues eventually gave rise, it is now necessary that I should tell you of the other change that was proceeding at the same time. It has been shown that the seeds with their woolly appendage or cottony pappus (the pappus is simply the calyx, adapted to form a balloon for conveying the seed to a distance), were the most valuable part of the plant for medicinal purposes, and it is easy to suppose that when these seeds could not be procured a substitute with a similar nature and appearance would be introduced, and called by the name which the genuine article bore. I would not say that the herbalists of the middle ages wilfully deceived people in this way, though, from what I have read and heard about the mandrake and other curious plants, I am sure they were often capable of doing very mean things; but of this I am certain, that, somewhere about the fifteenth century, the genuine article began to give way to a spurious one, and Bedegar became the name of something totally different from the white thistle of early times. You may judge of the surprise with which, after seeing the portrait of my early ancestor already referred to, I one day came across another portrait of Bedegar which had no family resemblance to the former whatever. It happened in this way. Many ages ago, there lived (not at the same time however), two very famous men named Theophrastus and Dioscorides, who wrote some learned books on natural history. Some centuries after, when printing was first employed for the multiplication of books, the writings of these men were presented to the public in both the Greek and the Latin languages. Other students of nature, inspired by these valuable but antiquated works, undertook to follow up the investigations already commenced, and when they found out any new fact which either threw light upon the writings of the early naturalists, or added something to that meagre stock of information, they used their facts as comments on, or explanations of, the writings of Theophrastus and Dioscorides. In one edition of their works we duly find the portrait of Bedegar as a white thistle; but in another this name stands also over a sprig of oak, bearing a woolly gall! The commentator, it is true, tells us, when speaking of *Spina alba* that it is called Bedeguard (this is the way in which he spells it), but he is apparently quite unable to see how the name has been transferred from one medicinal article to another. Here, then, we have, in a book published in 1644, the name Bedegar applied to a gall on the oak, and at the same time to a plant called *Spina alba*. The gall is usurping the place of the seeds of thistle, and appropriating its name. An old writer speaks of the gall as a spongy growth or excrescence on the oak. Since this growth is somewhat rare, however, in many places on the oak, but very common on the rose, it soon became the custom to speak of the rose-gall as Bedegar; and so thoroughly did the name attach itself to this article in a short time that all the books from the sixteenth century forward which treat of medicines and herbs apply the term Bedegar to the gall on the rose. I have only met with one exception to this rule. The famous old herbalist, Gerarde, earnestly protested, but in vain, against this unjustifiable innovation. In his curious old work, originally published towards the end of the sixteenth century (1595), and brought out a little later in a revised and emended form, he thus speaks on this subject: "The spongie balls which are found upon the branches (of the wild rose or Eglantine), are most aptly and properly called *Spongiolæ sylvestris Rosæ*, or the little sponges of the wild rose. The shops mistake it by the name of *Bedeguar;* for *Bedeguar* among the Arabians is a kind of thistle, which is called in Greeke *Akantha leuke*, that is to say *Spina alba*, or the white thistle, not the white-thorn, though the word does import so much." I certainly feel deeply indebted to this faithful champion of our cause for so clearly presenting our family claims and relationships; but as I have said, his protest was in vain; for, from that day to this, the "spongie balls" have still borne the name of Bedegar. As Gerarde gives a figure of the Eglantine bearing a gall (though he will not call it Bedegar), I have now been able to examine three portraits of my ancestors, and I cannot but feel amazed at the change which has taken place. From a thistle to a rose; from Arabia to Great Britain; from a cottony seed to a "spongie ball"! Fact is indeed still stranger than fiction.

It will perhaps be expected that I should explain what these spongy balls are, which, in modern medicine, bear my ancient name. I turn to the various works on medical botany which it has been necessary for me to procure in order to write this family history, and I find that all the most reliable authorities tell the same story—the galls are produced by insects. True, one old writer says that Bedegar is the name given to certain excrescences which grow spontaneously on roses; as though there were no external cause, or they were quite independently produced. Recent researches, however, shew that these growths do not come by chance, but are the regular outcome of certain well-known causes. Thus we read in one recent work that "On various species of the rose, perhaps most frequently on the sweet-briar (*R. rubiginosa*, L.) or eglantine, is found a remarkable gall, called the sweet-briar sponge (Bedeguar, or *Fungus rosarum*). Pliny terms it in one place a little ball in another a sponge. It is produced by the puncture of several insect species; viz., *Cynips rosæ*, &c. The bedeguar is usually rounded, but of variable size, sometimes being an inch, or an inch and a half or more in diameter. Externally it looks shaggy, or like a ball of moss, being covered with moss-like, branching fibres, which are at first green, but afterwards become purple. The nucleus is composed principally of cellular tissue with woody fibre; and where the fibres are attached bundles of spiral vessels are observed. Internally, there are numerous cells, in each of which is the larva of an insect (usually called a maggot); and if opened about August or September maggots (or larvæ) are generally found within. It is inodorous, or nearly so; its taste is slightly astringent, and it colours the saliva brownish. Dried and powdered it was formerly given in doses of from ten to forty grains. More recently it has been recommended as a remedy against toothache. Pliny says the ashes mixed with honey were used as a liniment for baldness. In another place he speaks of the gall being mixed with bear's grease for the same purpose." I have purposely omitted from the foregoing, certain medical and scientific terms, in order that the extract might be more intelligible to my readers; and must request them to be content with this paragraph, as a sample of the whole matter to be found in other medical works.

I have thus briefly, but as clearly as I was able, traced my family history from the earliest to the most modern times; and now in a few words, in order that the whole matter may be perfectly understood by the reader, I will give a summary of the result. The name Bedegar is of Semitic origin, and comes from a word Dakar meaning "to stab." From the verb we get the noun Deker "the stabber" (1 Kings iv. 9), then by adding Ben we obtain Ben-deker, Bed-deker or Bidekar (2 Kings ix. 25), meaning "the son of the stabber," or "the little stabber." This name was in the course of time applied to a spinous plant, and hence a thistle was known by the Arabs as Bedegar. This thistle, or certain portions of it, entered the ancient pharmacopæia or medicine list, then was carried to Greece, Italy, Germany and England where the name was still retained, along with its equivalent in the languages of those lands, as Akantha, Spina, Distel or Thistle. In course of time, however, the term was appropriated (about the fifteenth or sixteenth century) to another article, viz, an insect gall, and thus in the end the spongy balls on the wild rose came to be regularly known under the Arabic name of Bedegar, or the little stabber.

Idle, Bradford.

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. Brunetti.

1. INTRODUCTION.

IT will be my endeavour in the following papers to give an outline of the British Diptera.

Twenty years ago, but little was known respecting this order, but the labours of Messrs. Verrall, Meade, Dale (and, in a lesser degree, other entomologists), have resulted in rich collections of these insects, and with the material at present available, we may venture to speak with some approach to accuracy of the species of Diptera indigenous to the British Islands.

Mr. Verrall's recently-published list (1888) forms a splendid foundation for our researches, and the student, I trust, will find the following remarks of assistance to him during his preliminary investigations and first collecting excursions.

On the Continent the Diptera are tolerably well known and the fact of our knowledge of the British species being so unsatisfactory should be a greater incentive to the true entomologist, as the order offers far more opportunities of rendering real service to science than do either the Lepidoptera or Coleoptera.

It is true that students have few incentives to take up the study of the Diptera, as the disadvantages are so numerous; collections being few and far between, and usually the property of private individuals. The national collection of these insects is in a highly unsatisfactory state, for the very simple reason that no one has been employed to bring it anywhere near up to date; to correct the numerous and most palpable blunders in nomenclature; to fill up any of the large gaps made by the absence of whole genera, as well as numbers of the most common species; or to replace by fresh specimens the old damaged and dirty ones that do duty as the National British Collection.

Although collections available for reference, and books are so scarce, there are now fortunately several workers at this group who are fairly well acquainted with the order, and who, as a rule, are very ready, leisure permitting, to assist beginners by naming their captures; I myself being most happy to help collectors in this manner, provided the specimens sent for identification be in good condition.

2. COLLECTING.

Diptera, to put it shortly, may be captured in every part of the country in tolerable abundance, in almost every conceivable nature of habitat, disappearing only during the very coldest weeks, and even in mid-winter certain species (generally *Nematocera*) may be obtained by those who know where to look for them.

The ordinary gauze butterfly net is most useful for capturing them, and the sweeping net for those inhabiting the borders of streams, dry ditches, long grass, banks and other similar habitats.

As most flies rise, when alarmed, with great rapidity, a short quick stroke is necessary to capture them, a second opportunity rarely being afforded. It has been computed that certain species rise with a velocity of twelve feet a second.

As many groups and certain genera have a special manner of their own of taking flight, and of behaving when on the wing, it is of invaluable assistance when the collector is able to recognise at sight the family to which the intended capture belongs.

In sweeping, much discretion and experience is necessary, as the net rapidly fills with twigs, leaves, larvæ, beetles and spiders, these latter being the bugbear of the collector whilst sweeping, as they spin up the contents of the net (which I transfer bodily into large chip boxes, to be sorted out at home) into a tangled, unrecognisable mass, besides devouring a large proportion of the Diptera captured.

Larger species have to be captured singly and transferred to glass-top boxes, into each of which the collector with a little manipulation and experience should be able to place a dozen; care being taken to keep the carnivorous species separate (as Empis, Leptis, &c.) or one finds on reaching home, perhaps, every specimen more or less eaten.

Species in which the legs are exceptionally brittle and break off easily, should be given separate boxes, if possible (*Anthomyidæ*, *Tipulidæ*, *Dolichopidæ*, &c.), or at most only two or three specimens placed in each box.

Whenever the opportunity occurs, take a long series of a species, as by this means varieties may be obtained and the limits of specific variation fixed.

If a note-book of captures is kept, it will be found of invaluable assistance during subsequent seasons, and this plan should be adopted by all who desire doing anything of value towards completing our knowledge of the order.

3. PRESERVING.

Diptera should invariably be brought home alive, and killed by the fumes of burning sulphur. I am opposed to any method that wets them, as it mats the pubescence and frequently prevents indentification.

For mounting, I recommend the long Carlsbad pins, of which Nos. 0 to 4 are the most useful; the very minute species being pinned with the "minutien Nadeln," German pins, which are then stuck at one end of a small oblong piece of white pith, a Carlsbad No. 4 pin being put through the other end, and the pith pushed half way up the long pin. (See diagrams.)

The larger specimens should be placed above the middle of the pin, which should pierce the centre of the thorax.

I adopt the long pins for the following reasons:

1. The specimens are exchangeable with continental correspondents, all of whom adopt this method of pinning.

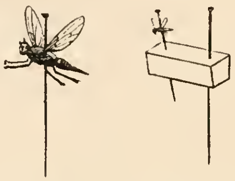

Fig. 13.—Methods of mounting Diptera.

2. They are easier to handle and therefore less liable to accident.

3. They allow a higher magnifying power to be brought to bear on them when in the cabinet by being nearer the glass.

A second important point to be observed in mounting is not to set the flies. They are as useful for scientific purposes unset as set, they are easier to handle, less liable to accidents, exchangeable abroad, and by not setting them a vast amount of time is saved.

I am aware that, on this point my opinion is directly opposite to that of our leading dipterologist, but still see no reason to change it, as it is only in exceptional instances that unset specimens cannot be identified, provided the directions given below are followed.

So long as the wings are extended vertically (and not allowed to cling together) and the legs kept from folding up close under the thorax, there is no difficulty in naming them, which is the chief objection raised by those who insist on the necessity of setting.

Their second plea—lack of uniformity in unset specimens—appears unsupportable, as a collection of Diptera pinned in the continental style seems to me as uniform and elegant as one in which the legs and wings are extended after the fashion of setting Lepidoptera. Moreover much cabinet space is saved by not setting them.

Every specimen should be dated and localised with a ticket attached to the pin below the insect.

Specimens may be relaxed by placing them in laurel, and for preservation against mites when in the cabinet, naphthaline is most frequently used by continental authorities, it being almost unnecessary to add that the cabinet should be kept in a warm dry room.

4. CLASSIFICATION.

Hardly any author's classification can be considered a standard one, the order having undergone such important revision during the last twenty years.

Several of the older authors, owing to their incomplete knowledge of the order, added altogether to our lists some hundreds of species that have no right to a place there.

Moses Harris was the first to write on the British diptera, and relied chiefly on the neuration as a basis of classification.

Curtis' work (1823-40) gives 112 really excellent coloured plates, and notices many species that he does not illustrate; his generic descriptions also being complete, and, in the main, trustworthy; but no attempt is made at analytical tables of genera or species, and many of the introduced species are now repudiated.

In Walker's work (1851-56), about 2000 species are described, though scores (I might almost say hundreds) of these descriptions are worthless. His work, however, is a most useful one to have, as a good general knowledge of the order can undoubtedly be obtained from it.

His analytical tables are not always good. He divides the order into three great groups, as follows:—

Antennæ lying flat in cavities in the head: *Suctoridea* (*Pulicidæ*).
Antennæ seated on the front of the head.
  Legs at juncture with thorax close together: *Proboscidea*.
  Legs at juncture with thorax wide apart: *Eproboscidea*.

His table of families is unsatisfactory, inasmuch as two families (*Empidæ* and *Muscidæ*) are split up and fall in both his subdivisions of *Brachycera*.

He divides the *Proboscidea* as follows:—

Antennæ with distinct joints, at least six, usually more than 10: *Nemocera*.
Antennæ, three to ten jointed, after the third closely jointed.
  Posterior veins branched or interlacing: *Brachycera*.
  Posterior veins simple, detached, faint: *Hypocera* (*Phoridæ*).

He gives nine families of *Nemocera*, seventeen of *Brachycera*, and two of *Eproboscidea*.

Books on this order are few and costly, the following being the principal ones relating to British Diptera:—Moses Harris, "Exposition of British Insects," 1776-1782. Curtis, "British Entomology," 1823-1840. F. Walker, "Insecta Britannica: Diptera," 1851-1856. Rev. F. O. Morris, "Catalogue of British Diptera," 1865. G. H. Verrall, "List of British Diptera," 1888.

No student should be without Mr. Verrall's list.

The most reliable recent papers are as follows:— "British *Sarcophaga*," Meade, "Ent. Month. Mag." 1876. "Annotated List of British *Anthomyidæ*," Meade, "Ent. Month. Mag." 1881. "List of British *Tipulidæ*" (with tables and notes), Verrall, "Ent. Month Mag." 1886. "List of British *Tabanidæ*" (with tables and notes), Brunetti, SCIENCE-GOSSIP, 1887. "List of British *Diptera*," Verrall, Pratt & Co., 1888. "List of British *Stratiomyidæ*" (with tables and notes), Brunetti, "Entomologist," 1889,

Fig 14.

Fig. 15.

Fig. 16.

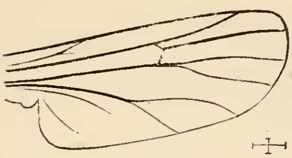

Fig. 17.

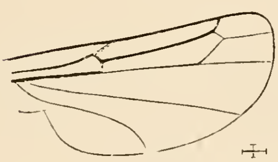

Fig. 18.

Fig. 19.

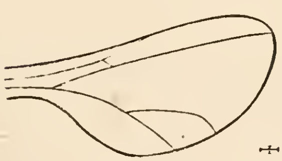

Fig. 20.

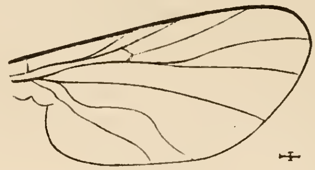

Fig. 21.

Fig. 22.

Fig. 23.

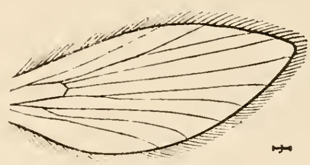

Fig. 24.

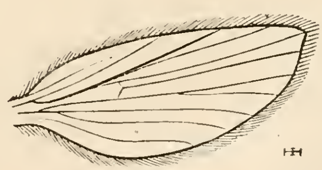

Fig. 25.

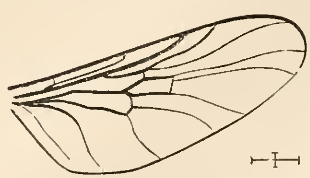

Fig. 26.

Diagram showing classificatory structure of Wings of Diptera:—Fig. 14, *Cecidomyia;* Fig. 15, *Hormomyia;* Fig. 16, *Sciaria;* Fig. 17, *Mycetophila;* Fig. 18, *Scatopse;* Fig. 19, *Bibio;* Fig. 20, *Diplosis;* Fig. 21, *Simulium;* Fig. 22, *Glaphyroptera;* Fig. 23, *Chinonomus;* Fig. 24, *Psychoda;* Fig. 25, *Pericoma;* Fig. 26, *Rhyphus.* Note.—All these wings are, of course, magnified, as shown by comparative measurements thus ⊢⊣.

The best works on European Diptera are the following: — Mergen's "Systematische Beschreibung," 5 vols. 1818–1838, Germany. Macquart, "Diptères," 2 vols. 1834–1835, France. Zetterstedt, "Diptera Scandinavia," 14 vols. 1842–1860, Scandinavia. Rondani, "Diptera Italicæ," 7 vols. 1856–1871, Italy. Schiner, "Fauna Austriaca," 2 vols. 1862–1864, Austria. Desvoidy, "Diptères des Environs de Paris," 2 vols. 1863, France.

The only catalogue of European Diptera is that by Schiner, published in 1864, giving about 670 genera, and 8600 species as European.

Schiner and Loew are, perhaps, the best recent Continental writers, and as no linear arrangement of families (entirely consistent with the structural characteristics of the various families) is possible, I shall adopt the sequence of Mr. Verrall in his lately published list as being the best and most recent authority on British Diptera.

Schiner (1862) gave a large quantity of introductory matter relating to the structure of the Diptera, but in his table of *Brachycera* families he, as Walker did, makes some families (*Empidæ*, *Dolichopidæ*, and *Conopidæ*) fall in both his primary divisions—which appears to me very undesirable; though I must add that I cannot myself suggest any table of families which shall be flawless in this respect.

In 1864 Schiner proposed dividing the Diptera into two great divisions—*Orthorhapha*, in which the pupa is sometimes coarctate, but in all cases the larva skin is slit longitudinally in the dorsal portion, to give exit to the pupa or perfect insect; and *Cyclorhapha*, in which the pupa is always coarctate, the perfect insect escaping by throwing off a sort of lid at one end of the dried larva skin which forms the cocoon.

In the same year Lioy submitted another classification.

Schiner, in 1864, estimated the described species of Diptera at about 19,449, distributed as follows:—Europe, 8670; Asia, 2046; Africa, 1644; America, 5517; Australia, 1056; of unknown locality, 516.

In 1868, the "Zoological Record" considered over 20,800 species had been described.

Brauer's classification, in 1869, was on larval characters:—

Orthorhapha:—
  Nematocera, three groups (twelve families).
  Brachycera, three groups (fourteen families).

Cyclorhapha:—
  Proboscidea:
    Group 1, *Syrphidæ*.
    Group 2, *Muscidæ* (including *Conopidæ*, *Pipunculidæ*, and *Platypezidæ* as divisions of *Muscidæ*).
  Eproboscidea:
    Hippoboscidæ and *Nycteribiidæ*.

In 1878, Osten Sacken produced another new arrangement of groups and families:—

1. *Orthorhapha.*—He does not subdivide these further than into families (most of these are the families of *Brachycera* and *Nematocera*, given in this paper).

2. *Cyclorhapha.*—*Syrphidæ*, *Conopidæ*, *Platypezidæ*, *Pipunculidæ*, *Oestridæ*, *Muscidæ* (he raises all my six sub-families of *Muscidæ*, and all the groups of *Acalypterata*, to the rank of families), *Phoridæ*.

3. *Pupipara.*—*Hippoboscidæ*, *Nycteribiidæ*.

I have not adopted either Schiner's or Brauer's latest systems; as, in a paper intended specially for beginners (as this is), it appears to me the tables should be based on characters of the perfect insect, not on those of the larva or pupa, with which the student probably would not be familiar. At the same time, I fully recognise that the structure of the pupa case is of the highest importance in classifying the Diptera.

5. DESCRIPTIONS AND TABLES.

In the Diptera the mouth is suctorial, the proboscis usually being rather long; there are two maxillary palpi; the thorax is compact, the pro-thorax and meta-thorax being very short, and the meso-thorax

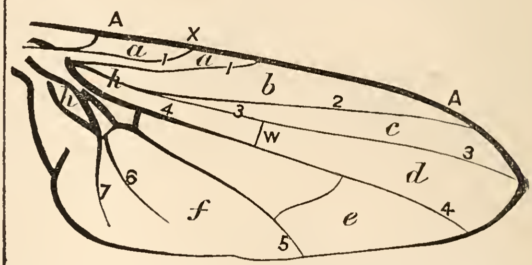

Fig. 27.—AA, costal vein. 1, first longitudinal vein (often double); 2, second ditto; 3, third ditto; 4, fourth ditto; 5, fifth ditto; 6, sixth ditto, or anal vein; 7, axillary vein; W, internal transverse vein; L, external ditto; *aa*, costal cells; *b*, marginal cell; *c*, submarginal cell: *d*, first posterior cell; *e*, second ditto; *f*, third ditto; *g*, discoidal cell; *hhh*, basal cells; X, costal spine (often absent).

much enlarged; forming the greater part of the thorax; the scutellum is rather large; the abdomen is usually formed of from five to seven segments; the wings are two in number, the posterior pair being replaced by alulæ, and a pair of filimentary appendages, clubbed at the tip, known as halteres; the legs vary greatly in size and length, the tarsi being pentamerous.

The *Pulicidæ* (fleas) do not appear to me to be true Diptera; so, although Mr. Verrall includes them in his list, I have eliminated them, as does Schiner in his "Fauna Austriaca." I may observe, however, that three genera and thirteen species are British.

The wing of one of the *Anthomyidæ* is given, with the terminology adopted by Dr. Meade and other British authorities (after Loew). It is exceedingly unfortunate that there exists such a diversity of opinion in the matter of terminology.

It is manifestly quite impossible, in the limited space at my disposal, to give more than a bare outline of the characteristics of each family, and a brief description of a few of the commonest species. Analytical tables of all the genera are out of the question: but I shall insert as many as possible, and these, with the plates of wings, will be found quite sufficient to enable the student, after a little study, to recognise all the families, and the greater number of the principal genera. In the small crosses, representing the natural size of wings given in the plates, allowance must be made for slight variation in the size in the different species.

The tables are intended to apply to the British genera only, and are compiled with a view to render the determination of sub-families and genera as easy as possible; and they may not always be the best from a strictly scientific point of view. The descriptions are purposely abbreviated as much as possible to save space.

(*To be continued.*)

DUCKING: A LINCOLNSHIRE SKETCH.

By Gregory O. Benoni.

[*Continued from p.* 18.]

AN amusing sight it is to the naturalist to see the bright-eyed speckled breast at his work, his legs straddling wide apart with exertion, and his whole being bent on the business in hand. He runs his beak into the soft body of the snail, and begins to hammer, rap-a-tap-tap, till it escapes from his hold. Then he hops round a while in reflection, wags his tail, and takes his rest with his head cocked to one side, and his gaze fixed on the dainty morsel enclosed in the protecting shell. When he has quite recovered his breath be "goes for it" again, this time with his "nib" thrust through a crack in the shell, which soon flies to fragments under repeated blows, and discloses the coveted treasure.

But this is not ducking, though we are almost within sight of the decoy, and the master-ducker is hastening down the path to meet us, with a "God bless you, squire, I'm right glad to see you and your friends;" an assertion fully in harmony with the beaming expression of his weather-beaten countenance, and the eagerness of his movements. To our inquiries whether we might see the ducks taken, and what kind of day might be expected, he answered with a wink of extreme satisfaction, as he swung his left arm towards the pond; "First rate, squire, first rate ducking-day, five thousan' i' th' 'coy if there's a score, I'll awarran'."

After a few more words relative to the splendid weather we were having for what he maintained to be the finest of sports—certainly it does require great caution and intentness—our entertainer conducted us through a young plantation of birch and ash, bidding us speak in undertones lest the ducks should hear us, and finally commanded us to observe perfect silence. He then vanished into a shed, and returned with a basket of hemp-seed, and some morsels of bread for the decoy-dog who now appeared following its master. It was a dog of the ordinary north of England shepherd type, half colley and half bob-tail, but worth a "fo'tin" to its owner notwithstanding its unassuming exterior.

Accompanied by this new addition to our party, we soon found ourselves close to the decoy, a circular sheet of water, four acres in extent, which had been made by deeping the natural hollow between two "hoes" or sand-hills, heaping up the soil thus gained round the edge of the pool, and supplying it with water from a drain connected with the Trent. A pipe, or gradually narrowing canal a hundred yards long runs out from the pond towards each of the cardinal points, curving to the right as it recedes, so that the birds on the main-water, or at the entrance of the pipe itself, cannot see more than half-way along its channel. Over the entire length of each pipe is a semi-circular iron frame supporting a net with a mesh of two inches, high in proportion where the ditch is wide, and contracting by degrees till it ends in a tunnel-net kept open by iron rings, and removable at pleasure. On the left side of each pipe runs a high fence, formed of a series of reed screens, so placed that the head of one is somewhat behind the end of the next, and only connected with it by a low stile or dog-leap, over which the observer can look straight up the pipe.

Wild fowl are so continually on the alert, and have such exquisite senses of sight and smell, that they can only be approached under cover from the leeward; woe betide the sportsman in the open fens, who believes himself to be getting within range of his game after hours of wary stalking, if the wind veer but a few points and blow from him to his would-be quarry—in the twinkling of an eye the birds take wing, and he is left to console himself with the thoughts of what might have been, if his fortune had proved equal to his endeavours.

The pipes of the decoymen are purposely so arranged that two can always be used at a time when the wind will blow steadily from one quarter. But the breeze must be constantly watched for fear that a sudden change should inform the ducks of their danger, and cause a sudden "rising," when mallard, teal, shoveller and pintail will disappear, leaving the common enemy to duckless and luckless lamentation.

While we were still some two hundred yards away our ears had become aware of unusual sounds, but now we were within a few feet of the water, the cry, quack, whistle, and cough of strange and unknown birds became most exciting. Initiated by the sign language of the decoymen, we placed ourselves at squints, or peeping-holes, formed by thrusting short sticks through the reed fence, but not before our long-limbed cockney friend, whose curiosity got the better of his discretion necessary on such an occasion, made our worthy instructor forget himself and his betters, by an attempt to look over the screen into the pond. When we were fairly settled in our places we beheld a sight never to be forgotten. There on the water close before us were thousands of lovely birds in their most perfect winter plumage, splashing, diving, musing, sleeping, or unconcernedly pruning their feathers, as if they were on some island of the Arctic Sea untrodden by the foot of man. Teal, pochard, widgeon, shoveller, gadwell, mallard, and I know not what—for time failed to observe the minute details of the wonderful scene—were sporting before us, the very embodiment of grace, or sunning themselves on the water's edge. One pair of mallards were performing the ingenious and pretty feat of swimming round one another, and making a circuit of the pond at the same time,—as astronomers tell us that some twin stars move through space. The air reverberated with constant cries, which apparently had their source in the jealousy of an unusual number of drakes; and the sound of many wings broke ceaselessly on the ear.

We had gazed for some time in wonder and admiration, when the old "ducker" joined us, delighted to observe what pleasure his unusual show was giving. For although we had often watched the fowl before, it had never been our lot to see such numbers of common wild-duck, or so many rare birds on the pool together.

"Now did ye ever see sich a sight o' ducks onywheare in your life? Why, I tell ye, ye wouldn't see it in England, nor in the world, I'm thinkin'," he whispered, as he mopped the perspiration from his forehead with heavy dabs from a heavy silk pocket-handkerchief.

"Well, it is a splendid sight, and such a one as we have never seen before," we replied, in the same scarcely audible speech he himself used.

"A splendid sight," drawing back, and holding out his hand, as if our qualifying adjective had not been strong enough; then, nearing again, so as to allow his ghost-like voice to reach us, "I've had gentlemen in days gone by who would have come three hunded miles to see such a vast o' em in at once. My governor"—his old employer—"would ha' had all his fine friends here, if he'd been alive, he would."

The work of capture now began. The boy donned a bright red flannel vest, and stationed himself behind the first "shooting" or screen, lying flat on the ground, and hidden from any ducks which might enter the pipe by the low connecting stile. His grandfather then threw a piece of bread over it on to the strip of land between the "shooting" and the water's edge, and the dog immediately bounded after it and returned by the second stile, though not before the ever-observant ducks, on the near side of the pond, had noticed his presence.

The whole decoy was on the alert for danger at once. The birds on the shore took refuge in the water, those which were swimming stopped for a time, and all eyes watched for the unknown apparition to present itself again. The dog leaped several times over the first stile, returning by the second, then over the second and back by the third, and so on, retreating gradually, every fowl regarding the performance with fear, wonder, and curiosity combined. Yet as he made no attempt to injure them, but moved slowly away up the pipe, they presently fell back on their ordinary sense of security, and began to sleep, dive, and coquet again. The fatal desire to increase their stock of available knowledge—the bane of other than feathered victims—evidently over-mastered the prudence of a score or two of birds. They began to follow the mysterious object in its retreat, hesitating some time at the mouth of the pipe, swimming this way and that, straining their necks, and turning their bright eyes hither and thither, in a vain effort to learn the meaning of the overhanging net, or to watch the dog passing out of view round the bend in the pipe. The bolder ones entered when the dog disappeared, followed by their more cautious companions, though some few retired discreetly at the last moment. Under the net they sailed, unconscious of the meaning of the treacherous meshes above them, till, at a given signal from the decoy-man, the red-vested lad leapt to his feet and showed himself over the stile in their rear.

The effect was magical. The shy explorers took wing together without a cry or warning to those left behind, and not daring to face the foe, fly forwards, catching sight of each of us in turn as they pass the stile of the screen through which we are watching. Dashing through the water in mad fear, or beating their wings against the imprisoning net, only to be thrown back to their native element again, they reached the end of the pipe and entered the circular net prepared for them, which the decoy-man removed as soon as the last of the "take" had passed into its jaws.

Now came the poor sport of the show—the killing. This was performed by the expert placing his fingers over the beak, the thumb over the first joint of the neck, and then giving the head a backward jerk to the right side of the neck, which caused the immediate dislocation. Painless enough as deaths go, but an inglorious ending for the freedom-loving mallard and teal.

The whole affair was a dumb-show of a few minutes' duration. Not a single word was uttered aloud till the decoy-man had killed and counted twenty-eight birds. Then, wiping his brow with the sleeve of his coat, he said, with a grin of satisfaction, "Fust-rate sport, Squire; your friends never saw owt like this before, nor never will again."

This mode of taking wild-fowl is called "working them" by professional duckers; but it is more commonly known on paper as the "dog-decoy." It is often productive of a fair take, especially of birds fresh from the north, but it is far surpassed by the "duck-decoy" now to be described.

(*To be continued.*)

FLIES IN AMBER.

OUR lady friends and readers perhaps know more about the æsthetic merits of amber than we do. They (and those of their gentlemen friends who like their amber clouded in the mouthpieces of their expensive meerschaums) may not, however, be so familiar with its geological and mineralogical origin as other people. Seaside visitors to the eastern coasts frequently find it worth their while to come from great distances and pay very expensive prices for lodgings in the summer time in order to stroll upon the beach, if haply they may pick up three half-penny worth of amber between dinner and tea. Amber has very nearly the specific gravity of sea-water, and, if it does not float, is easily drifted along from the Baltic to our eastern coast, but many splendid specimens are picked up along the seaward margin of the Eastern counties. A magnificent collection of specimens of amber, which floated hitherwards from its parent bed, is now in the possession of Mr. W. D. Sims, of Ipswich.

Many people may neither know nor care to know that amber is a fossil gum which exuded from pines and other trees two millions of years ago. They may not be acquainted with the fact that the great storehouse of genuine amber, not the artificial muck the youngest smoker admires and proudly displays, comes from the bed of the Baltic Sea, and frequently contains the remains of various kinds of insects, which lived here during the middle period, as well as leaves, petals of flowers, and other floral organs, just as another Tertiary formation shows. This is nevertheless correct; and a bit of genuine amber in the lump is a most interesting geological specimen—frequently a perfect nest of fossilised flies which were attracted to the amber when it was a sweet and liquidly-flowing gum, and then and there got entangled in it as summer-flies in treacle, so as to suggest the poet's conundrum that—

> The thing itself is neither rich nor rare,
> The wonder's how the devil they got there.

In the last number but one of the "Annals and Magazines of Natural History" there is a paper by Herr Richard Klebs, of Konigsberg, on "The Fauna of Amber." The metropolis of the genuine Baltic trade is at Konigsberg, so there is ample opportunity for the professor to study an abundance of specimens. He has been engaged twelve years on this special subject, during which, he tells us, several hundred thousand species of amber passed through his hands, and of these he has arranged and catalogued about 25,000 selected specimens. In addition to the Konigsberg collection, Mr. Klebs selected, arranged, and catalogued another belonging to the Prussian Government, containing 12,000 specimens of amber. Only those familiar with the slow and tedious (although delightful) process of classificatory arrangement know what trouble and pains all this involved.

Mr. Klebs (to sum up a long and necessarily technically abtruse paper—all the more scientifically valuable on that account) is able largely to contribute to our entomological knowledge the evolution of many modern groups of insects. In amber, for instance, are found kinds which are intermediate between gnats and the brachypterous, or short-winged flies. Perhaps we know more of the early history of those highly-celebrated insects, the ants, from their fossilised appearance in amber than from any other contributing geological source. Among the fossil insects imprisoned in amber, we learn that the two-winged flies, of which our too-attentive house-fly is a familiar example (Diptera), is most numerously represented. It always has been, even before the days of "fly-papers." Mr. Klebs has made the acquaintance of 20,000 of them in amber alone. What a geological immortality! It is pleasant to find that fossil-lice are not numerous in amber—they reserved their numerical abundance to a later stage of the Tertiary period. Gnats and mosquitoes also "lay low" during the Miocene epoch. Those filmy-winged, flower-evolving insects (Hymenoptera) are very frequently found in amber. What a life-history is theirs! If only some accurate and true scientific entomologist arise—a prophet who had knowledge enough to gaze from the top of Pisgah, not only from the presentment of the Promised Land, but on the "backward track" (Phylogeny) of the forty years' wanderings in the wilderness! Professor Klebs' paper is practically all this and more. Among his studies of fossilised amber are 4000 enclosed beetles, 5000 members of the Neuroptera (or white ant and dragon-fly family), 2500 specimens of Orthoptera (cock-roaches, crickets, locusts, earwigs), and lastly Mantido (or leaf-insects). The reader would hardly imagine that the amber specimens include more than one thousand sorts of butterflies and moths. Then come fossil amber bugs, plant-lice, or aphides (who would imagine the latter were living millions of years before men and women?). Centipedes, "saw-flies," spiders (2500 specimens) are found in amber; they came after the flies, just as the flies were after the sweet gum, and shared the same glorious fate and immortality. A few land-snails are also found, thanks to their sluggish habits. There is sometimes the feather of a bird, the scales of a lizard, and other odds and ends. But what a recording angel a lump of amber may be, and what a host of important suggestions hang to and cluster by the above matter-of-fact discoveries!

J. E. TAYLOR.

MR. C. H. H. WALKER, 12 Church Street, Liverpool, has constructed a new slide cabinet, made more especially for biological and medical students, and issued, post free, at 4*s*. 6*d*.

SCIENCE-GOSSIP.

Recently a baby seal was born in the Blackpool Aquarium. It is said to be the first seal born in this country in captivity. Unfortunately it was still-born; had it lived, the value of the event would have been still greater to the company. But, as it is, the occurrence is one well worthy of note on account of its "uniqueness."

It is with much sadness we have to record the death of an eminent scientist and occasional contributor, Dr. James Croll, author of "Climate and Time," "Stellar Evolution," &c. Dr. Croll rose from being janitor at Glasgow University to being an Hon. LL.D. of the same.

Anybody desiring to know the history and botanical associations of that popular flower the carnation, should read Mr. F. N. William's paper in "The Journal of the Royal Horticultural Society" (Part 3, vol. xii.), entitled "The Carnation from a Botanical Point of View."

A useful contribution to the wants of book-seekers and collectors is the last published catalogue of Messrs. Doulan & Co., relating to "Zoological and Palæontogical Works" offered for sale by this well-known firm. A new periodical has recently been issued, entitled "The Entomologist's Record and Journal of Variation."

"The International Journal" is now the proud name given to the alliance of the ancient journals entitled "Wesley Naturalists' Societies," and "Postal Microsopical Society." Both did good and honourable work; but the Philistines are usually opposed to Samson! Now we cordially recommend to our readers the first part of a New Series: "The International Journal of Microscopy and Natural Science; The Postal Microscopical and Wesley Naturalists' Societies' Journals," price *6d.*, edited by Alfred Allen, and the Rev. W. Spiers (London: Baillière, Tindall & Co.).

We are glad to draw the attention of our readers to the recently published Catalogue of Messrs. Dulau & Co., 37, Soho Square, London, devoted to general Zoology and Palæontology.

The Literary and Philosophical Club, 28 Berkeley Square, Bristol, was formally opened on January 1st. Nearly five hundred members have already joined, and it is to be hoped that the club will become a literary and scientific centre for Bristol and its neighbourhood. Public lectures will be given at intervals under the auspices of the club. The first President is Mr. Lewis Fry, M.P., and Mr. Henry A. Francis holds the office of Honorary Secretary.

Messrs. Swan Sonnenschein & Co. have just published a cheap and excellent and highly useful pamphlet, written by Mr. T. D. A. Cockerell, entitled, "The British Naturalist Catalogue of the Land and Freshwater Mollusca of the British Isles, with all the Named Varieties."

Messrs. Wesley & Son's last Natural History Circular is devoted chiefly to works and papers on Mollusca and Molluscoidea.

Mr. R. G. Mason has just brought out a cheap and useful, as well as highly ingenious combination of a lantern with a microscope. The combination enables the lecturer to exhibit microscopic objects to an audience. The combination can be easily dissevered, and the microscope used as such in the ordinary fashion.

At the beginning of February perhaps the most important sale of high-class natural history books which has occurred for many years, is announced to take place at Messrs. Hodgson's Literary Sale Rooms, which many of our readers would like to be informed about. Catalogues can be obtained of Mr. W. P. Collins, 157 Great Portland Street, London. The collection is stated to be rich in sets of scientific journals, such as Journals and Transactions of the Linnæan and Microscopical Societies, "Annals and Magazine of Natural History," "Archiv. für Mikroskopische Anatomie," "American Naturalist," and many other valuable English and foreign serials. The collection of separate monographs is particularly rich in microscopy, entomology, invertebrate zoology generally, and botany. There is also a large collection of pamphlets covering every branch of natural science, classified and arranged according to subjects. The Polyzoa, Protozoa, Arachnida, &c., are said to be very complete.

MICROSCOPY.

The Vertical Camera.—I infer from Mr. Simmons' description of his instrument (Science-Gossip, Jan. 1891), that it is the Zeiss camera lucida which he refers to, and as I have used this apparatus successfully for some time, perhaps I can give him some little assistance. In the ordinary camera lucidas the object to be drawn is projected upon the paper which lies behind the microscope, the instrument being placed in a horizontal position. In the Zeiss camera, however, the image of the paper is thrown upon the stage of the microscope, and the object appears to be lying upon the paper, so that the drawing can be made with ease as the pencil appears to be upon the actual object instead of following a projected image of it. The neutral tint reflectors, Wollaston and other forms of cameras, require the microscope in a horizontal position, and the eye looks straight downwards upon the drawing-paper; the worst position for head and eye, and the most uncomfortable that can be assumed. But with the

Zeiss instrument the microscope may be at any chosen angle, and this is where its greatest advantage lies. In working, I use a small drawing-board, made so that it can be arranged at any angle. Setting the microscope with the tube at about 45°, I place the drawing-board on the right hand side, level with and on the same plane as the microscope stage, and the paper placed directly under the centre line of the mirror attached to the camera. The following points should be attended to: (1) The angle of the drawing-board should be exactly the same as that of the microscope stage, and the centre of the drawing should be under the centre line of the camera mirror, otherwise there will be distortions in the drawings, as Mr. Simmons found, and the picture will be out of proportion. (2) The drawing should be on a level with the microscope stage, that is, the distance between the camera mirror and the drawing paper should be the same as between the eye-piece of the stage, if the magnification is required to be the same in drawing as under the microscope. (3) The light on the object and that on the drawing-paper should, in neither case, be so bright or so dull that one obcures the other, or either the paper will be too dark and the pencil point lost, or in the other case, the paper will be so illuminated that the object will disappear altogether. A little practice will, however, soon enable the respective lights to be arrived at easily; that upon the stage being modified in the usual way from the lamp, and that upon the paper by means of the neutral tint glasses supplied with the camera lucida. I have found that blackening the pencil point enables its being more easily seen against the white paper.—*M. L. Sykes, Patricroft.*

Pocket-Lens.—Would some reader kindly tell me how I can ascertain the magnifying power of a single (pocket) lens? When I place it upon an object, I want to know how many times that object is magnified?—*W. F. Kelsey, Maldon.*

Mounting Cochineal Insects.—There is one thing I should like to draw attention to, and that is the mounting of sections (cochineal) so as to show the little purple granules, containing the colouring matter. I have tried nearly every kind of liquid, but find that in every case the colour is extracted and mingled with the fluid, thus ruining the specimens at once. The only thing I find I can use is turpentine, which preserves them splendidly, but the puzzle is what cement can be used to contain the turpentine? Perhaps some correspondents could give hints concerning this, which I think would prove useful to others as well as myself.—*H. Durrant.*

Land and Freshwater Shells.—Will any Conchological readers of Science-Gossip kindly oblige with particulars of the distribution of the Mollusca in the home counties? Is there any published list obtainable?—*Charles Pannall, Junr., East Street, Haslemere.*

ZOOLOGY.

The "Proceedings" of the Liverpool Geological Society contain the following addresses and papers:—By the President, "On the Life of the English Trias"; "Notes on the Geological Excursion to Anglesey," by T. M. Reade; "Glacial Moraines," by L. Cumming; "Note on a Liverpool Boulder," by T. M. Reade; "The Contorted Schists of Anglesea," by Dr. C. Ricketts; "Microscopical Examinations of Two Glacial Boulders," by J. E. George; "On a Recent Discovery of a new Bone Cave at Deep Dale, near Buxton," by J. J. Fitzpatrick; "An Examination of a Few Anglesea Rocks," by P. Holland and E. Dickson, &c.

The "Transactions of the Penzance Natural History Society" include the following papers, besides reports of excursions, &c.:—"The Presidential Address" of the Right Hon. L. H. Courtenay; "The Flora of Guernsey compared with that of West Cornwall," by E. D. Marquand; "Foreign Plants in West Cornwall," by W. A. Glasson; "Plants growing in Tresco Abbey Gardens," by A. H. Teague (this collection of living plants on a small island is one of the most wonderful facts in horticulture); Mr. Teague also contributes a paper on "Starch as a Vegetable Production."

The first Part of the "South Eastern Naturalist" is published as the Journal of the Associated Natural History Societies of the south-east of England. Among the chief papers in this first and well-edited number are the following:—"Life History of the Giant Hogweed," by J. Reid; "Beds between Chalk and London Clay," by George Dowker; "Notes on the Great Pipe Fish," by G. Dowker; "Leaf Fungi of 1889 in the Neighbourhood of Dover," by W. T. Haydon; "The Otolithes of Fishes," by Sydney Webb; "A Neolithic Find near Dover," by W. T. Haydon, &c.

Black-Necked Grebe.—A fine specimen of the eared or black-necked grebe (*P. Nigricollis*) was shot on the Ouse, near York, October 23rd, and brought to me in the flesh. It has since been stuffed and set up by Helstrip, bird and animal preserver of this city. Messrs Clarke & Roebuck, in their 1881 edition of the "Yorkshire Naturalists' Handbook," record this species as having occurred in Yorkshire on eight occasions. The bird is now in my possession.—*William Hewett.*

A New British Worm.—The Rev. Hilderic Friend, F.L.S., has recently discovered a new and curious British worm, first described in 1851 by Dr. Grube from a single Siberian specimen under the name of *Lumbricus multispinus*. On account of its difference in structure it was removed by Vaillant from the genus Lumbricus, and made the representative of a new genus called Echinodrilus. The worm is only an inch in length when full grown, and has from three to six setæ in each group, four of which groups or combs are placed on each segment save the first. It is abundant in the one locality where it is at present known to occur. The worm is being figured or described elsewhere.

THE COLOURS OF SHELLS.—In reply to Mr. Barnes, the only publications on this subject, besides those published by myself (SCIENCE-GOSSIP, August, 1890, and "Naturalists' Gazette," July and August, 1890, with a note in the "Zoologist" the year before last), Mr. Pace's note (SCIENCE-GOSSIP, September, 1890), and Mr. Fryer's article (SCIENCE-GOSSIP, November, 1890), known to me are as follows:—Mr. T. D. A. Cockerell, SCIENCE-GOSSIP, January, 1888 (referred to by Mr. Fryer); Mr. J. W. Taylor, "Valedictory Address," "Journ. Conch.," April, 1888 (referred to by Mr. Fryer as the supposition of Mr. Taylor on p. 242, *ante*, but really being the supposition of Mr. Ashford); E. Schumann, "Schr. Ges. Danz." (2), vi. p. 2; Bandelot, "Bull. Soc. Strasb." i. (1868), pp. 132–134; Dietz, "J. B. Ver. Augsb." xxv. (1879), p. 92; Hartmann, "Gastropoden d. Schweiz," 1840-44, p. 17; Colbeau, "Bull. Soc. Mal. Belg." vii. p. 89; Gredler, "Nachr. Mal. Ges." 1878, pp. 33-37; Tryon, "Structural and Systematic Conchology"; Williams, "Land and Freshwater Shells," p. 19; H. E. Poulton, "The Colours of Animals"; Eimer, "Organic Evolution"; Cockerell, "Zoologist" (3), x. p. 341; Simroth, "Nachr. Mal. Ges." xviii. pp. 65–80; Dodd, "Journ. Conch." iv. p. 304; Eimer, "Tag. Deut. Nat. Vers." lviii. p. 408. In addition to these there exists a note of which I have not the reference by me, but think it was published in the "Journal of Conchology." This is by Miss Hele, and records the darkening of *H. aspersa* by feeding on lettuce. Possibly there are other papers of which I have not summaries in my note-book. An interesting paper by the Rev. Mr. Pearce, on the variations in *Helix caperata*, has been lately published in the "Journal of Conchology." In addition, the following papers may also interest Mr. Barnes:—Krukenberg, "Verg. Physiol. Vorträge," iii. 1884; Macmunn, "Q. J. M. S." 1877 and 1885; "Proc. Birm. Philosoph. Soc." iii. 1881–83, and vol. v.; "Journal of Physiology," vols. vi. and viii.; "Phil. Trans." 1885 and 1886; "Proc. Physiol. Soc." 1887; "Brit. Ass. Reports," 1883; Lankester, "Q. J. M. S." vol. xxii.; Poulton, "Proc. Roy. Soc." 1885; Pocklington, "Phar. Journ, Trans." vol. iii.; Moseley, "Q. J. M." xvii.; and the papers of Mr. Gulich, "Nature," July 18th, 1872; "Journ. Linn. Soc."; "Zoology," vols. xi. and xx.—*J. W. Williams.*

BOTANY.

THE VALUE OF ATTRACTIVE CHARACTERS TO FUNGI.—Mr. C. R. Straton writes to "Nature" as follows:—The importance of attractive colours and odours, and of modifications of form to flowering plants is now perfectly understood; but the value of attractive characters to Fungi has received comparatively little recognition. At first sight it would seem unnecessary that a plant, unsusceptible of fertilisation, should possess characters apparently designed to enlist living creatures in its service: there is no pollen for them to carry, and no ripe seed for them to distribute, and attractive characters, such as colour, taste, and odour, are extremely well marked. The colours which fungi exhibit include almost every hue from white to black. We have the brilliant red of peziza cups: the orange-scarlet of the *Amanita muscarius*, with its cap gaily speckled with white; the crimson of the *Russula emetica;* the rich yellow of the *Cantharellus cibarius;* the blue of the bruised *Boletus luridus;* the amethyst of the *Agaricus laccatus*; and the dark green of the bruised *Lactarius deliciosus*, with every possible shade to the deepest jet. But not only have fungi colours that are attractive by day; some, like the *Agaricus olearius*, are phosphorescent by night. Many tropical species light up the jungle in the hours of darkness; and in this country the coal-mines are often found illuminated by one of the polypores which propagates itself on the timbers of the workings. The tastes and odours of fungi are equally varied and attractive. Many Agarics have an odour of fresh meal; the *Hydnum repandum* rejoices in the flavour of oysters; the *Armillaria mucidus* in that of nuts; the yellow chanterelle in that of apricots; others have the scent of various flowers, such as the violet and woodruff; or of aromatics like anise; while a large number have an indescribable damp-cellar or fungus smell, such as slugs delight in. Many, like the shameless stinkhorn (*Phallus impudicus*) emit an intolerable stench, which so strongly resembles "the carrion of some woodland thing" that blow-flies and ravens quickly find it out. There can be little doubt that these are attractive characters. What, then, can be the service which these characters induce animals to perform for fungi? To answer this let us review briefly the life-history of any fungus possessing characters of an attractive kind. The common mushroom (*Psalliota campestris*) is particularly agreeable to sheep and oxen, and is abundant in autumn in rich pastures, although there is still much in our knowledge of its life-history that is incomplete, yet it is evidently composed of two main periods: first, a parasitic period passed in the body of an animal host; and secondly, a saprophytic period passed on some suitable organic soil. Let us sow the spores of a ripe mushroom as carefully as we may, none of them will grow: the first stage of the mushroom's existence must be passed in the body of an animal host; and as horses, sheep and oxen are all readily attracted by its taste and mealy smell, it has never any difficulty in finding a host to take it in. When once the spores have passed from the body of the host, they produce a mycelium, from which the future mushroom is formed. The connection between fungi and animal droppings is a matter of very early observation, and our forefathers were wont to believe that certain evil species came from the body of the Wicked One, and familiarly called them tode's stools, or devil's droppings. In this division of the life-history of fungi, I believe, we have the key to the value of attractive characters. Horses, oxen, sheep, foxes, squirrels, moles, birds, snails, and insects are all attracted by appropriate scents, tastes, and colours; and the forms and habitats of fungi are those which have least succeeded in attracting their particular hosts. There is no living being either great or small enough to escape the attentions of these plants in their ceaseless endeavours to attract; and among fungi, just as among flowering plants, every variation of form, scent and colour has been perpetuated and developed, because it has been successful in attracting and in thus securing the multiplication of the species. The subject is one, I think, that requires the gathering together of much individual observation in all parts of the world; and it would be well if those who have the opportunity would note at the time the name of the fungus and its observed host, and if students of biology, who possess facilities for laboratory work would follow the matter still further by artificial cultures, and so determine the changes that take place in the body of the host, and the course of the alternating sexual and agamous generations.

CHLOROPHYLL IN PLANTS.—Mr. J. Ballantyne's article in November's issue of SCIENCE-GOSSIP is most interesting. A few years since I dug up in my garden a hyacinth bulb which had been buried so deep that it could never have come to the surface. Its leaves were green, and the purple flower gave evidence that colour can be produced without light and air. I think I mentioned this at the time, and no notice was taken of it.—*Rev. S. Arthur Brenan, Cushendun.*

HYDROCOTYLE ASIATICA.—In a recent number of SCIENCE-GOSSIP I see amongst the Notes and Queries a reference to the plant *Hydrocotyle Asiatica.* I have never heard of its use as a cure for leprosy; but that it possesses medicinal and tonic properties is evident from the fact that it is used by the Tamil and Singhalese natives in Ceylon as a fish-poison. During a residence of some years in Ceylon, I frequently witnessed the operation. The leaves and stems of the plants are pounded into a pulp and stirred into the pool containing the fish, the stream having been first diverted into a side channel. The fish soon show signs of uneasiness, and rise to the surface of the water, they are then easily captured by hand. Both *H. Asiatica* and *H. Javanica* are used for this purpose.—*E. Ernest Green.*

HYDROCOTYLE ASIATICA.—En réponse à la question posée par Me. Edith R. Allan dans le dernier No. de votre journal, p. 282, j'ai l'honneur de vous adresser la note suivante, qui, j'espère, répondra aux désirs de votre correspondante. *Hydrocotyle Asiatica* (L.) est une petite plante employée depuis long-temps dans la thérapeutique indienne contre la fièvre et surtout pour ses propriétés thérapeutiques. En 1872 le Dr. Boileau, qui était atteint de lèpre, crut s'être guéri par l'emploi de cette plante, et des détails à ce sujet ont été publiés par Bouton. ("Medical Plants of Mauritius"). Le Dr. Boileau est mort de la lèpre. Des expériences ont été faites à l'Hôpital des Lépreux par le Dr. Alex. Hunter qui ne parût pas lui avoir reconnu une grande efficacité. Le Dr. J. Shortt considère l'hydrocotyle comme pouvant donner de bons effets dans les affections lépreuses en raison de ses propriétés altérantes et toniques. La plante a été analysée par un pharmacien de la Maison de Pondichéry Lépine, qui y a trouvé un principe particulier. La dose est poudre 3 grains par jour, teinture alcoolique $\frac{1}{3}$ grain.—*Dr. J. Léon Soubeiranz, Professeur à l'École de Pharmacien, Montpellier.*

CREPIS TARAXIFOLIA AS A SUSSEX PLANT.—In your issue of November last your correspondent R. B. P. records the finding of the above at Willingdon. I may state that it also grows in profusion at the Buxted end of the railway cutting between Uckfield and Buxted, where I gathered specimens last June. It is quite possible that it may occur in other localities as it might easily be overlooked or mistaken for some allied species.—*F., Uckfield.*

EUPHORBIA CYPARISSIAS IN KENT.—If Messrs. Styan and Haydon will refer to the report of the Botanical Localities Record Club for 1876, they will there find the occurrence of this spurge in Kent duly notified. Specimens were distributed by me to the members of the Botanical Exchange Club in that and the following year. In one of the numbers of SCIENCE-GOSSIP for 1890, mention was made of the plant having been gathered near Eastbourne. It is frequent on the chalk slopes of Normandy, where I have seen it growing in open places among box and juniper; also in Switzerland, in bushy places on calcareous soil, and by roadsides, but not in woods. I did not see any of it beyond Leuk.—*E. de Crespigny.*—P.S.—See also February number of this periodical for 1877.

AUTUMN COLOURS AND TINTS.—The remarks on autumn colours by Professor Pellsbury, which appeared in a recent number of SCIENCE-GOSSIP, are in the main correct, but do not seem to be entirely so. For instance, erythrophyll, the red colouring-matter of the cells of plants, is certainly not "derived from chlorophyll by the chemical forces of the plant." On the other hand, xanthophyll (phylloxanthin) undoubtedly is so derived, and it is the only colouring pigment of leaves at all events that is so related to chlorophyll or directly connected therewith. The statement, therefore, that "the chlorophyll of the green flower or fruit is changed into a special colouring-matter such as anthoxanthin, etc.," can hardly be borne out. So far as the caves are concerned, the state of affairs seems to be this. During the whole life of the leaf, or at least as soon as the normal amount of chlorophyll has been formed therein, a small quantity is perpetually being changed (oxidised) to xanthophyll. This quantity is so small, or rather I think its colouring power is so comparatively feeble, that it is, as stated in the extract, "more or less comparatively covered up by the presence of chlorophyll," i.e., by the blue-green constituent thereof. When the life of the leaf is destroyed by frost or drought, the chlorophyll is rapidly changed to xanthophyll, and this latter constitutes the first of the series of autumnal tints. It very quickly, however, gives way to the ochre, russet, and orange-brown, which are the distinctive features of the autumnal woods, until ultimately the dark, muddy, unpleasant shades of final dissolution close the scene. The chlorophyll and its derivative xanthophyll seem to be completely destroyed or bleached, and thereupon the russet or brown colours depending on totally different principles came up into a supremacy which is more or less vigorous and durable, according to the variations of the season. As Sachs has it, "the distinctive yellow autumn coloration of leaves depends on the yellow coloration of the disorganised chlorophyll bodies: the autumnal brown coloration of the cell-walls, chiefly, however, of the cell-contents." I need hardly add that my personal researches amply corroborate these observations of the great German botanist. What then, it may be asked, is the cause of erythrophyll, the exquisite red colouring matter of the American maple leaf in the fall? The chemical cause is the oxidation or hydration of the gallotannic or gallic acid, which is abundant in the autumn; and the special vividness of the colour in this particular case is due to the comparative delicacy and flaccidity of the tissues whereby the oxidizing agencies of the air, etc., can operate freely and potently. Some American correspondent will doubtless correct me if I be wrong; but judging from some dried maple leaves that I possess I consider that, as compared with our own sycamore, their texture and consistency are considerably more herbaceous, i.e., more thin and flaccid. The following facts seem also to support the main conclusion. A small thin bright red sycamore leaf growing on a young shoot in mid-summer was analysed, and found to contain much gallic acid and a little chlorophyll (about as much as an early red copper beech leaf contains), and sugar. The other leaves of the same shoot were completely green, but were much larger and stouter. I once found an autumn sycamore leaf whose vivid tints seemed to vie with those of the Transatlantic forest. I picked it up: it was thin, delicate, and breaking to shreds. On boiling the redder portions in dilute alcohol the pigment dissolved leaving them almost quite colourless; and the solution gave the reactions of erythrophyll, acetic acid, and a little gum, and unchanged gallic acid.—*P. Q. Keegan.*

NOTES AND QUERIES.

NEST OF BOMBUS LAPIDARIS.—In September last, I found, in a small enclosure adjoining my garden, a nest of *Bombus lapidaris*, and as my little girl played on this ground, I removed it. The nest was situated at least twelve feet from the wall in a corner formed by the two walls meeting. The turf was smooth all round for more than six feet. In one direction, in the corner, was a small heap of stones covered with moss and nettles. A careful inspection—no hole nor appearance of one, except at the nest, which was of proper size. The nest was found about seven inches deep, and one foot from entrance. After carefully clearing the earth and stones all round, I put my fingers under the nest so as not to disturb the contents. Judge my surprise, when the nest was safely placed on a board, to see the skull of a stoat sticking out on one side. I found the nest was built on a dead stoat, the body being curled around with head raised in a comfortable manner. The fur was worked into the covering of the nest. Do these bees take advantage of dead animals for the sake of the fur? Or is there any other such case on record?—*C. W. P.*

SEAWEEDS.—In reply to F. H. B.'s query (p. 262), I am sorry to say that I have not yet sufficient experience to answer his questions; but a lady-collector, who spends a great deal of time at Swanage, told me that she found four species of Delesseria there, and several other uncommon seaweeds, of which I have now forgotten the names.—*A. H. B.*

VEGETABLE TERATOLOGY.—In SCIENCE-GOSSIP for November, Dr. J. E. Taylor gives an account of strange monstrosities in plants. The case of the "Arum" Lily of the Nile has come under my own notice also, and the case in which the sepals of fuchsia have reverted to the leaf condition. I once found on cutting open an orange what appeared to be a fungus growing in the centre, which I dried and kept.—*Rev. S. A. Brenan.*

CURIOSITIES IN EGGS.—In accordance with a wish expressed by Mr. J. P. Nunn, in the April number of SCIENCE-GOSSIP, that collectors would chronicle any curiosities in eggs with which they may meet, I have here written an account of such as have come under my notice. One of the most curious freaks in eggs which I have ever observed is a case which came under my notice in the spring of the year 1890. On May the 12th, I was shown two eggs, with somewhat the appearance of robin's, though much larger, and with only one or two large red spots on them. The person who showed them to me said that he had taken them from a nest in a wall, and that he had substituted two robin's eggs from another nest. On the night following, I went with the above-mentioned person to the nest. It was nearly dark when we reached the place, and upon putting his hand into the hole he drew forth the mother bird, which proved to be a robin. This was not very surprising, but, upon our examining the nest, we found it to contain, besides the two substituted robin's eggs, three purely white ones. From the facts of this case, I should conjecture that the hen bird had exhausted the stock of colouring matter in the first two eggs, and that consequently the subsequent three were white. In the eggs of the common thrush also I have found eccentricities. On April 5, 1890, I saw a throstle's nest containing four eggs, all of which were very large, and were marked with large red-brown blotches, with the exception of one, which was marked like ordinary specimens. On May 27, I observed a throstle's nest containing two specimens of the rounded spotless eggs of the thrush, mentioned by Mr. Nunn and others. I have seen several eggs of this class taken from this district, and also those of the blackbird of the same type, i.e. devoid of markings. On May 3, 1889, I took a blackbird's egg entirely covered with deep red markings, and much resembling a ring-ouzel's, from a nest containing four others of the ordinary greenish colour. A friend of mine in this town has in his collection several notable curiosities, all taken by himself, e.g., a white sparrow-hawk's egg taken from a nest containing three others of the ordinary type. Two house-sparrow's eggs with the markings gathered in a cap at the large end, and a dwarf magpie's egg about the size of a marble. In two instances have I met with greatly elongated eggs, a missel thrush's taken on April 8, 1890, and a blackbird's. On May 10th, 1890, a throstle came under my notice which was sitting on four of her own eggs and a blackbird's, all of which were nearly hatched.—*Rowland H. Hill, Halifax*

VAR. OF P. NAPI, ETC.—In looking over my collection of Lepidoptera, I note the following which may be of some interest. A female specimen of the green-veined white (*P. Napi*), in which all the nervures on the upper side are very deeply marked, showing a perfect outline of the veins, and with a broad band of dusky shading at the lower margin of the front wings. Possibly this is one of the varieties formerly ranked as distinct species; it was taken at Richmond Walk, May 26th, 1887, from a cluster of nettles. Also a specimen of the pearl bordered Fritillary (*A. Euphrosyne*), which was netted at Bickleigh Vale, May 21st, 1888. It was at the time a perfectly fresh insect, but with its left front wing crumpled, with the markings in miniature. Thus showing that some mishap had befallen it whilst emerging from its aurelial covering.—*Frederick G. Smart.*

NATURAL HISTORY NOTES.

Nov. 3rd.—Rooks busy building in their rookery—one old bird sitting in the nest and its mate was breaking off twigs and carrying it to the one in nest—the other birds were busy in the same way.

Dec. 1.—Skylark singing.

A heron is called a goose ghost in this locality, and is stated to be able to pass an eel through its body and then eat it. At the fell moon it is considered in good plump condition.—*Rev. S. A. Brenan.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

TO OUR RECENT EXCHANGERS.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

F.—A special number of SCIENCE-GOSSIP devoted to the Hepaticæ was published in 1865 or 1866, abundantly illustrated. We fear it is now out of print, but apply to Messrs. W. H. Allen & Co., Waterloo Place, London. We are always pleased to welcome new contributors.

J. FORDYCE.—Apply to Mr. W. F. Collins, 157 Portland Street, W., for information concerning Leighton's "Fasciculi of British Lichens." He may have a Fasciculus.

H. BROWNE.—Your guess is probably right, but take the egg to the Norwich Museum and compare it.

R. D.—Get Burbidge's book on "Cool Orchids and How to Grow Them" (published by W. H. Allen & Co., Waterloo Place, we believe).

R. ADDINGTON.—Get Dr. M. C. Cooke's admirable little book (published by the Society for Promoting Christian Knowledge) on "Pond-Hunting" (price 2*s*. 6*d*.); or, still better, the same indefatigable Dr. M. C. Cooke's book on "Freshwater Algæ," just published at 5*s*. by Messrs. Kegan Paul & Co.

H. A. M.—The editor cannot undertake to send copies of his magazine to writers of books sent for notice who inform him they do not take in SCIENCE-GOSSIP. That is both their fault and their loss.

R. DRAPER.—Get Professor Asa Gray's book on "How Plants Grow, Climb," &c. (fairly cheap, if you get it second-hand of Messrs. Wesley & Son, Essex Street, Strand; or Mr. W. P. Collins, 157 Great Portland Street). In that capital manual you will find all that you want, and more to stimulate you for years to come, than any three lines of common-place explanation could give you. The sun has not got so much to do with the climbing as the plants have.

EXCHANGES.

WANTED, a good *Murex adustus*. Offered, "Naturalists' Gazette," 1890, complete.—W. Jones, jun., 27 Mayton Street, Holloway, London.

OFFERED, 1-inch objective, 16°, by Tentmayer. What offers in exchange in micro-slides or books? Apply—T. W. Derrington, 46 Worcester Street, Wolverhampton.

WANTED, SCIENCE-GOSSIP for 1874. Address—W. F. Kelsey, Maldon.

WANTED, a few fern fronds showing capsules, dried leaves, *Onosma taurica*, &c., and sand containing micro-shells. State exchange requirements.—H. Ebbage, Framlingham, Suffolk.

OVER one hundred species of beautifully mounted ferns, in handsome half-bound book, fitting into strong case. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

FINE and well-set species of British lepidoptera, in exchange for postage stamps (unused copies of obsolete English, and used or unused foreign desired).—Joseph Anderson, jun., Alre Villa, Chichester.

V. moulinsiana offered for *L. involuta*, *S. oblonga*, or *acme*; also fossils, &c., in exchange for rock specimens, especially slides.—Rev. John Hawell, Ingleby Greenhow Vicarage, Northallerton.

FORAM. sand from Barmouth, Montereau, Mauritius; chalk, coal measures, sponge, W. India, Channel Isles and Etagé

Langhien. Sections of corals and spongy forms, minute recent corals, coral vars., &c., also about half-a-dozen crystals, &c. Wanted, material (no diatoms or forams), ground-edge slips, cells, thin glass covers, living pupæ, or anything pertaining to natural history.—H. Durrant, 4 Boulton Road, West Bromwich.

SMALL collection of British and foreign shells, unnamed, 180 specimens, sixty or more varieties. Also small geological collection. What offers? or will exchange for good book on British beetles.—H. Browne, 53 St. Philip's Road, Heigham, Norwich.

WANTED, the following British land and freshwater shells:—*T. haliotidea, scututum; A. marginata, gagates; L. lævis, cinereo-niger, arborum; S. oblonga, H. obvoluta; V. antivertigo, lilljeborgi, moulinsiana, substriata, tumida, angustior; A. lineata, P. acuta, H. Jenkinsii*, and vars. of all water shells, also Continental and other foreign land and freshwater shells. Will give American land and freshwater shells, birds' skins, nests and eggs, living land tortoises (box), and beetles, butterflies, and fungi mosses. Foreign correspondence solicited.—W. J. Farrer, box 16, Orange, Va., U.S.A.

FOR exchange, a small collection of land, freshwater, and marine shells, fossils, &c., about 80 species, 200 specimens. Wanted, good microscope objective, ¼ or ⅙.—S. O. Grocock, M.C.S., 13 Lower Maryon Road, Charlton, Kent.

"ATLAS of Fossil Conchology" (Brown's), 114 large plates, 3500 figures, published 1889 at three guineas, offered for collection of fossils or mineralogical specimens. Wanted, "The Micrographic Dictionary."—Mr. Stewart, 17 Upper Gilmore Place, Edinburgh.

WHAT offers for Darwin's "Phytologia," first edition, quarto, boards; Darwin's "Zoonomia," second edition, 2 vols. quarto, calf; Karl Russ's "Speaking Parrots;" Greene's "Amateur's Aviary of Foreign Birds;" Marshall's "The Frog;" also SCIENCE-GOSSIP for 1884 and 1889.—H. Roberts, 60 Princess Road, Kilburn, London.

SMALL collection of minerals, in case, offered in exchange for fossils or shells.—T. W. Reader, 171 Hemingford Road, London, N.

NEW Zealand shells, principally marine, offered for shells not in collection, foreign land and freshwater species preferred.—W. A. Gain, Tuxford, Newark.

WANTED, Harvey's "Phycologia Britannica." Offered, Crouch microscope with 1-inch and ¼-inch objectives, or Zeiss ⅟₁₂-inch immersion objective.—T. H. Buffham, Comely Bank Road, Walthamstow.

WANTED, SCIENCE-GOSSIP, Nos. 253–308, in exchange for first-class micro-slides.—W. Tutcher, 57 Berkeley Road, Bristol.

DUPLICATES.—*Sophina calias, Streptaxis Blanfordi, S. Theobaldi, S. Burmanica, S. bombax, S. exacutus, Clausilia Waageni, C. Theobaldi, C. insignis, C. Gouldiana, C. cylindrica, Helicarion Flemingii, Cataulus albescens, Rapharlus chrysalis, Hybocystis gravida, Cyclophorus Siamensis, C. speciosus*; list of many others. Desiderata, Indian and South American land shells.—Miss Linter, Arragon Close, Twickenham.

WANTED, any books relating to microscopy, also choice unmounted material, in exchange for choice microscopic slides of every description.—R. Suter, 5 Highweek Road, Tottenham, London.

WANTED, an injecting syringe and a Valentin's knife.—H. P., 103, Camden Street, London, N.W.

Oldhamia antiqua and *O. radatia*, Cambrian rocks, Bray Head. What offers in minerals or fossils for the above?—William Doyle, Seapoint Road, Bray, Ireland.

COLLECTION of dried plants, fifty species, made in Italy and France, 1844, most mounted. List on application. What offers? To be disposed of complete; mosses desired.—Miss E. Armitage, Dadnor, Ross.

CASSELL'S "Science for All," 5 vols. (clean, unbound), "Knowledge," 2 vols., 1887, 1888 (clean, unbound), and several others, offered in exchange for British land and freshwater mollusca not in collection. Send list to—C. H. J. Baldock, 67 Brewer Street, Woolwich.

DUPLICATES.—Varieties of guillemot eggs, including some choice forms. Desiderata, British birds' eggs not in collection, or varieties of same.—W. Hewett, 6 Howard Street, Fulford Road, York.

VALUABLE Grecian clausilias, and other shells, offered for shells not in collection.—Address—Miss F. M. Hele, 11 Elmgrove Road, Cotham, Bristol.

A FINE collection of Scotch graphites offered in exchange for rare tropical shells.—Address—Miss F. M. Hele, 11 Elmgrove Road, Cotham, Bristol.

ADVERTISER wishes to correspond with some person who will undertake to send names of South African spiders and scorpions in exchange for specimens.—F. West, Poplar Villa, Lansdowne Place, Port Elizabeth.

"Royal Microscopical Journal," 1869–1887, inclusive, in parts, all clean and perfect. What offers?—B., 3 Brownhill Road, Catford, Kent.

WANTED British and foreign shells not in collection. Offered, many other shells.—E. R. Sykes, 9 Belvidere, Weymouth.

OFFERED, more than 550 species of plants from the North of France, in exchange, at once, for as many species, provided they be not French ones. Write to M. Abel Briquet, 49 Rue Jean de Bologne, Douai (Nord), France.

WANTED, January, 1890, number of SCIENCE-GOSSIP. 1s. offered. Address—Rev. W. Langley, Narborough Rectory, Leicester.

OFFERED, about 400 species of fossils of the tertiary Parisian grounds, well named, in good state of preservation, and in good number; also living shells. Wanted in exchange, fossils of other tertiary grounds, living shells, prehistoric matters, and postage stamps.—M. Louis Giraux, 22 Rue Saint Blaise, Paris.

OFFERED, good case of ichthyosaurus, from lias of Lyme Regis, 22 × 12. Wanted, any good fossils from any formation.—M., 56 Clarendon Villas, West Brighton.

A. BONNET, 9 Rue Mazagrau, Paris, offers good fossils from the Paris tertiaries in exchange for fossils from all formations, and recent shells.

WANTED, brilliant foreign coleoptera; need not be set, but must be correctly named. Good exchange given in first-class botanical sections, either mounted or unmounted, or objects of general interest. State quantity of specimens with sample.—R. G. Mason, 69 Clapham Park Road, Clapham, S.W.

Bryum Marrattii, B. calophyllum, B. Warneum, Hypnum cristi-castrensis, Catoscopium nigritum, Buxbaumia aphylla, and a few others, in exchange for microscopic slides.—Geo. Forbes, 7 Graham Place, Dundee.

FRESHWATER fishes. Wanted, to correspond with anglers or others who could supply good fresh specimens of trout, roach, perch, pike, &c., suitable for purposes of taxidermy. Would give in exchange preserved specimens in any branch of marine zoology, micro-slides of highest class, scientific books.—J. Sinel, 6 Peel Villas, St. Helier, Jersey.

WANTED, odonata (dragonflies) from all parts of the world. State desiderata in return. North American odonata for exchange.—Philip P. Calvert, Academy of Natural Sciences, Philadelphia, Pa., U.S.A.

WANTED, entomological store boxes and apparatus in good condition. Exchange secondary or tertiary fossils, or eggs and nests of our common birds.—W. D. Carr, Lincoln.

COLLECTION of British shells, entomological setting cabinet, collecting box, and store box. Will exchange for books or anything useful.—J. Morton, New Brompton, Kent.

OFFERED, SCIENCE-GOSSIP for 1890, and January, 1891. Wanted, carboniferous fossils. Send lists to—B. T. Bonser, Colebrooke House, 29 Highbury New Park, London.

WANTED, to correspond with collectors in Britain and abroad with the view of exchanging birds' eggs in the coming season. Send list of wants and duplicates. Can offer many species o American eggs on British list.—Robert Williams, Croase House, Kingsland, R.S.O.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Acids in Practical Geology," by G. A. J. Cole (London: C. H. Griffin & Co.).—"Fathers of Biology," by Ch. McRae (London: Percival & Co.).—"The Honey Bee," by T. W. Coward (London: Houlston & Sons).—Wesley's "Nat. Hist. and Scientific Book Circular," No. 105.—"Knowledge."—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Nature Notes."—"Proceedings of the Geologists' Association."—"Victorian Naturalist."—Dr. C. V. Riley's Report to the U.S. Dept. of Agriculture (always welcome).—Same author on "Insecticides and means of Applying them to Shade and Forest Trees" (published by ditto).—Dulau's "Catalogue of Zool. and Palæontolog. Lit."—"Brtish Naturalist Catalogue of Land and Freshwater Sbells Great Britain," by T. D. A. Cockerell.—"Journal of Quekett Microscopical Club."—"British Cage Birds," Part 9.—"British Canary Book," Part 9, &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: E. B.—A. B.—Dr. A. C.—Dr. A. B. G.—E. C.—C. W. P.—A. H. B.—E. G. B.—A. B.—L. G.—A. J. J. B.—W. L.—S. A. B.—W. H.—Dr. G. C. M.—R. H. H.—A. C.—Prof. J. L. S.—E. E.—G. W. N.—R. M.—F. B. C.—G. R. S.—F. M. H.—V. A. L.—E. E. G.—F. W.—E. N. L.—F. G. S.—W. B.—W. F.—C. P.—R. S.—W. C.—W. J. F.—F. N. W.—L. O. C.—W. D. S.—H. R.—T. W. R.—W. A. G.—T. H. B.—J. H.—H. D.—J. F.—H. B.—J. T.—Miss E.—C. H. J. B.—E. B.—E. H. F.—J. A., jun.—Dr. E. De C.—H. E.—W. F. K.—M. B. M.—W. D.—M. L. S.—W. J. J.—T. W. C.—C. W.—J. B. H.—J. E. L.—G. F.—J. T.—F. C. M.—H. A. F.—V. C.—H. F.—R. G. M.—J. S. W.—A. B.—W. T.—Miss L.—E. H. J. B.—J. W. R.—J. B.—W. A. G.—W. J. S.—J. E.—E. G. P.—W. B.—E. B.—Dr. G. T. C. M.—C. W.—F. C. M.—L. W. M.—J. C. S.—R. S.—H. D.—W. W. P.—W. M.—W. A. P.—W. B.—R. A. B.—J. B. C.—A. B. G.—W. E. W.—W. T. P.—G. H.—H. M.—H. G. W.—W. W. F.—W. T. H.—H. W.—C. H. H. W.—P. P. C.—P. Q. K.—W. W.—R. W.—B. T. B.—W. D. C.—J. M.—R. A.—&c., &c.

JOTTINGS CONCERNING CERTAIN FRUIT-TREES.

By MARY B. MORRIS.

The Apricot.

THE origin of this tree has been much and long disputed, and travellers are still of divers opinions on the subject. By some it is referred to Armenia as its native country, and this would seem to arise from its having anciently borne the name of *Mailon Armeniacon*, by which the learned Dioscorides calls it, whilst, as he tells us, the Latins called it Raikokion; our modern botanical name still seems to refer it to the same origin—we designate it *Armeniaca vulgaris*. Neither Greeks nor Romans seem to have known or cultivated it prior to about 100 years B.C. There is abundant evidence, on the other hand, that the Chinese, who were so well versed in both gardening and horticulture in the very remote ages of antiquity, cultivated the apricot at least 2200 years B.C. A writer who flourished in China from 2205–2198 B.C. describes the tree and the fruit under its name, "Sing," as very abundant on the hills. The wild fruit would appear to have been small, the skin yellow and red, with a reddish-yellow flesh, of an acid flavour, but quite eatable; both fruit and leaves were equally similar to our cultivated species, but considerably smaller. Pliny writes of it as "Præcocium," from the precocity of the species, and probably our English name is but a corruption of this word, since our earlier cultivators of it were wont to speak of it as a precox; the unlearned united the two words, and wrote aprecocks, abrecocks, &c.

Various authors have described it as growing, apparently wild, in great abundance in the Caucasus and around the Caspian and Black Seas, whilst on the other hand, Koch (and some others), who travelled through the region of the Caucasus and Armenia, with a view to making observations upon the natural productions of the countries visited, reports that during a prolonged stay in Armenia he nowhere found a wild apricot, and but rarely a cultivated one. French travellers do not agree as to its being found wild in Persia, but that it grows in great abundance there, far from the haunts of men, we read in Dr. Wills' interesting work, "The Land of the Lion and the Sun," in which he speaks of vast numbers of trees, the fruit of which was falling to the ground in enormous quantities, so that he wished some enterprising person could be found who would set up a "canning" business there and then, and by utilising the tempting fruit, redeem them from waste and destruction, and make his own fortune in the venture.

A kind of wild apricot has been found growing amongst the ruins of Baalbec, but from the description given, both leaves and fruit differ considerably from our ordinary apricot. A French writer, Mons. Regmër, represents that the apricot is probably a native of the oases of the desert of Egypt—an opinion which he founds upon these circumstances: first, that the modern Greek name Perikokka closely resembles the Arabic Berkhach; secondly, that vast quantities of the fruit are actually dried in the oases and brought to Egypt, where they are called Mishmish; and thirdly, that the early period of the year, when its blossoms unfold, indicates that the tree belongs rather to a southern than to a northern climate. This last reason can scarcely be held good, since we know that many plants, such as some kinds of blackthorn, which are without doubt natives of the coldest regions of Europe and Asia, bloom and unfold their leaves equally early.

That the tree was not known in Egypt at an early period we may conclude, from the fact that the

Hebrews did not know it, and have no name for it in their language; they would have known it, and the Romans have had it much earlier than they had if the fruit had come from Egypt. Though found abundantly now in Algeria, it is evidently of recent introduction, having naturalised itself in districts where the stones have been thrown away from cultivated specimens.

The apricot is frequently found wild in the hills between the Jumna and the Ganges, and from a writer on the botany of the Himalayas and Cashmere we learn that the apricot is so generally planted around the villages that there are few without them, the fruit being eaten fresh, and also dried, whilst a very fine oil is expressed from the stones. The use to which this oil is still put is mentioned in a recent book of travel. Mrs. Bridges, in "A Lady's Tramp Round the World," gives an account of a Thibetan ball at which she was present in the Himalayas, the room in which the festivity was held being lighted with oil made from apricot stones. In some parts of Cashmere apricots and other fruit trees form a perfect jungle. The dried fruit has been brought from Cashmere to India in considerable quantities; it is called Khoot-banee.

The apricots on the Himalayas, at 12,000 ft. elevation, are so hard, that a native when carrying his load of them to market, thinks nothing of sitting upon his burden—a strong contrast this to the custom of a well-known character in an eastern county at the early part of the century. This gentleman, being the owner of a large estate some seventy miles from London, and having gardens so prolific that the produce was the source of considerable revenue to him, after the supply of his own table had been provided, was accustomed to send the surplus produce to Covent Garden; and the wall fruit when ripe being very perishable, and easily injured, he directed that it should be placed in shallow baskets to be carried on women's heads, the tread of a man being considered by him too heavy for the conveyance of the luscious load.

The apricot tree was late in coming to England, being introduced here from Italy, as far as we can ascertain, in the year 1524, by Woolf, gardener to Henry VIII., who, it appears, introduced several valuable fruits at about the same period. It is strange that a fruit so well known in the east should not sooner have reached our western regions, but we know that in Britain there were, up to the sixteenth century, but few establishments save the monasteries which had orchards or gardens attached to them. Happily, during the reigns of Henry VIII. and Elizabeth the spirit of discovery pervaded the land, and one of the results of an acquaintance with new lands, and that no mean result either, was the introduction of many fruits and flowers which had hitherto been unknown to us. By the middle of the seventeenth century most common fruit trees were cultivated in sufficient abundance to render their importation unnecessary.

The progress of this improvement, however, was but slow, owing to the want of nurseries for such trees; and persons who lived in remote places, and wished to introduce into their gardens new varieties of fruit, were obliged, Hartlib writes, "often to send 100 miles for them;" no trifling obstacle, let us remember, these "100 miles," when roads were bad and there were no facilities for their conveyance such as we now possess.

It is no part of my intention in these "jottings," to teach my readers the best method of cultivating fruit trees. I will not pretend to recommend one sort above another, one system of pruning before another, though, if any of my readers should be so generous as to set before me ever so large a variety, I will undertake to give my opinion as to kinds, when I have been made free to place them under the crucial test of a somewhat sensitive palate. Still, I may be allowed to give them the advice of a wiser gardener than myself, as to the time for planting trees and for gathering their fruits.

Old Thomas Tusser, under "January's Husbandry," writes as follows:—

"Set chestnut and walnut,
Set filbert and smallnut.

"Peach, plum-tree and cherry,
Young bay and his berry,
Or set their stone,
Unset leave none.

"Sow kernel to bear
Of apple and pear;
All trees that bear gum
Now set as they come.

"Now set or remove
Such stocks as ye love."

For gathering, under September's Husbandry:—

"The moon in the wane, gather fruit for to last,
But winter fruit gather when Michel is past;
Though michers* that love not to buy or to crave,
Make some gather sooner, the few for to have.
Fruit gathered too timely will taste of the wood,
Will shrink and be bitter, and seldom prove good;
So fruit that is shaken and beat off a tree,
With bruising and falling soon faulty will be."

DUCKING: A LINCOLNSHIRE SKETCH.

By Gregory Benoni.

[*Continued from p. 40.*]

AFTER a short rest to allow the old master to recover from the exertion and excitement incidental to the capture, we proceeded to the eastern pipe by a hidden pipe running through the sheltering copse at the foot of the sand-hills. Here, instead of employing the dog, which must not appear too often, for fear it should cease to excite curiosity, the decoy-ducks were called to our aid. There are a number of cross-bred birds originating from the wild and domesticated varieties. They live in the decoy, and are fed in the

* Michers = pilferers.

pipes throughout the year, so that they are always ready to obey the call-note of their master, however distant they may be from his station. On this occasion the "decoys" were lying by the wind-bound western pipe, where they had supped the night before. But as soon as we had taken our new places the decoy-man blew a shrill blast on his whistle, which startled the whole pond, and made the drakes give tongue in clamorous chorus, whilst the decoys awoke to the sense that breakfast is an admirable institution.

Again the whistle sounded, and yet again, till the birds comprehended whither they ought to steer; and meanwhile the lad scattered hemp seed upon the water along the whole length of the pipe.

Soon we saw the trained birds making their way across the centre of the pond, accompanied by some three hundred wild fowl. On they came, a sight most enchanting, as they flashed in the January sun, and reflected its lustre from their iridescent plumage, till at last the leaders and their mingled following reached the head of the pipe.

The tame birds began to devour the seed with great eagerness, for they cannot escape from the pond and its immediate surroundings except by flight, which they rarely attempt, and little food is to be found in such an over-tenanted place. The wild birds, too, began to feed, and gradually advanced up the canal under the net, without any apparent fear of danger, while we slowly retired before them for fear of discovering our retreat.

The scene was strangely picturesque, as the crew of mallard and teal, with here and there a stray shoveller or pintail, pressed onwards with grace in every turn and movement, a grace which seemed to give the lie to their connection with the heavy farm-yard louts who claim cousinship with them. But while we were yet admiring their beauty, and trying to fix some of their natural positions in our mind for future drawings, the scene changed. Jack showed himself abruptly in their rear, and the greater number fluttered wildly up the pipe; though a few saved themselves by flying or diving back into the pond. We followed the doomed flock at a gentle pace, gesticulating violently but silently to drive on the laggards when they showed any disposition to return. At the end we found the tunnel net taxed to its utmost strength, so jammed had the poor birds become in their fearful rush.

"Six shillings a couple for ducks, and four for teal, as they're up now," murmured our old entertainer, in an ecstacy of delight at his extraordinary good luck. "Niver, niver, saw I owt like it i' all my born days, an' shouldn't if I liv'd to be twice as old again as I am, rheumatiz an' all."

As he spoke he knelt down, and proceeded to take out and dispatch the birds with great caution, his grandson helping in the work, but with less skill; when, "whir, whir, whir," sounded above us from the rhythmical cadence of many wings, and glancing up, we descried some sixty ducks on the look out for any possible danger, flying round and round the tops of the trees, as their custom is before alighting. The Londoner, entirely forgetful of the strict injunctions to taciturnity, exclaimed in excitement, "What the devil's up with us! Where's a gun?" But a threatening shake of the fist from the old man, accompanied by a look which ought to have annihilated him, brought him back to a sense of decoy *convenances.*

"Doon for yer lives; lig oot at length; lig on your bellies an' hide your heads." Then to the stupified townsman, "Get into yon rummuck"—a tangled mass of brambles and dead nettles—"onywhere, onywhere oot o' the birds' sight."

Such were the commands issued by the irate ducker in an agonised whisper, and down he dropped on his net, from which not a quarter of the ducks had been extricated, with his head and shoulders thrust into a bed of withered herbage, despite the "rheumatiz and all."

We skulked and crouched as best we might, trying to look as unlike human beings as nature would allow; while round and round, up and down, here and there, went the birds, often dipping till they almost touched the water, yet always sheering off when our desire that they should settle seemed on the point of gratification.

"They're going, they're going," ejaculated the old man below his breath, with many strange inarticulate gutturals expressive of impatience and expectancy. "Noo, noo, they're in, I do believe. Ay, they're in at last. Jack, just get up an' hev a peep, lad."

Up got Jack forthwith to spy through the reeds on "the shooting," but only to fall flat again as if shot. For up and down and round about went the watchful flight for some minutes longer, till at last, when our patience was almost exhausted, they dropped into the pond breast foremost, cleaving the ripples in the most delicate and pretty manner in the world.

The moment the last bird touched the water we rose from our constrained attitudes, to indulge in a quiet joke over the thorny retreat in which our southern friend had ensconced himself, and to congratulate ourselves on the sport we had seen.

"These here will be fresh from the sea," observed the ducker, beginning to draw the quarry from the net again, and holding up a teal for our inspection. "Them as th' dog got was scarcely touched wi' red, but these have breasts as rust-coloured as can be—they know nowt of fresh water. I bet they cum'd in this morning."

Birds newly arrived from the ocean are far less wary than the land-feeding fowl, which are generally home-bred, or old stagers, acquainted with every device of the fowler. Some birds visit the decoy for years in succession, and are never taken; as was the case with a mallard duck, which had a ring of white feathers round the neck, and was much sought after for the proprietor's collection of stuffed birds.

Before we quitted the decoy the master showed us an anomaly among the trained birds, no less than a duck more than thirty years of age. It had been in the pond all its life, and had grown curly tail feathers like a drake for some seasons, having ceased to lay, or take any interest in nesting matters, though surrounded by descendants to the twenty-eighth generation.

But enough for the present. We had seen a noble day's sport, and made a notable bag, for seventy-nine teal, sixty-three mallards, seven widgeon, four shovellers, a pintail, and a "tame-flier," or barn-yard duck, which had joined its wild relations, were counted into the game-room. A better take had not been known for some years.

After mutual congratulations, we shook hands with the jubilant decoy-man, promising to come again for another look at his birds, and turned our steps homeward, talking of gunnery and fowling as we went.

(*To be continued.*)

A NEW BRITISH MOSS.

Cinclidotus riparius (Walker Arnott).

"SEARCH has been repeatedly made without success," says Wilson, for the moss whose discovery in Great Britain it is now a pleasure to be able to announce in these columns.

The little river Teme, which winds its picturesque way along part of the southern boundary of Shropshire, and for some distance divides that county from Herefordshire, here forming deep and silent pools, there rippling lightly over the stony shallows, and bedecked with water-weeds all so much alike to the casual observer, but of such variety and interest to the lover of nature, has at last delivered up to us the little weed for which "search has been repeatedly made without success." The fortunate finder is Mr. Arther W. Weyman, of Ludlow, who collected it in April last, and sent it to me recently, with other specimens, for consultation. It was evident at once that it differed from any British moss which one could regard as allied to it; and having a slight acquaintance with *Cinclidotus riparius*, I concluded that it must be that species. Dr. Braithwaite, Mr. J. E. Bagnall, and Mr. H. Boswell have kindly looked at it, and settled the question in the affirmative. Dr. Braithwaite states that it was found two years ago in Ireland, so that the present is not absolutely the first record of the species for the United Kingdom. A description of it with figures will duly appear in the "Br. Moss Flora."

The name *Cinclidotus riparius* is already somewhat familiar to us, as it occurs in Wilson, Berkeley, Hobkirk's Synopsis, ed. 1873, &c., but only in connection with its assumed variety *terrestris*, now known as *Tortula mucronata*, *Barbula mucronata*, or *B. Brebissoni* (Brid.). The true *C. riparius* is different in habit, usually darker in colour, and larger. The leaves are straight when dry, smooth (not papillose), margins slightly thickened and plane (Fig. 28 A); whereas in *B. mucronata* the leaves when dry, though incumbent and only slightly twisted or bent inwards on the lower parts of the stem, are much twisted at the tips of the branches. They are strongly papillose, the margins more thickened, and recurved. Sometimes the effect under the glass is that of a plane

Fig. 28.

Fig. 29.

Fig. 30.

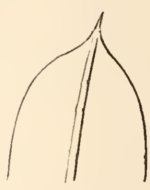

Fig. 31.

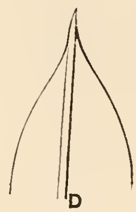

Fig. 32.

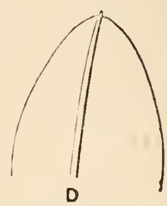

Fig. 33.

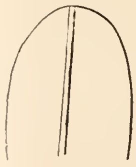

Fig. 34.

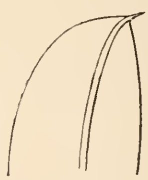

Fig. 35.

margin with the whole of the thickening occurring on the under side of the leaf, so as to give the appearance of a recurved margin (Figs. 29 and 30 B). The nerve is generally excurrent (Fig. 31 C), and the areolæ smaller.

In some states the two mosses much resemble each other. Wilson says: "Bruch and Schimper positively affirm that they have witnessed the existence of every intermediate form," and the writer possesses specimens of each which are so much alike that, failing the very minute investigation demanded in the present day, they may easily be taken for the same. But let the necessarily careful examination be made, and the distinctions pointed out above are there unmistakably, leading to the conclusion that the two are as closely allied as are the *genera* in which they are respectively placed by modern authors, but not more so.

The present moss may have been overlooked in mistake for *C. fontinaloides*, but if a number of specimens of the latter from different localities be compared together, the leaves, while varying a good deal in width, termination of the nerve, and also slightly in the size of the cells, will be found to be always more or less acute in general outline (Figs. 32 and 33 D), only the actual point sometimes obtuse, and strongly twisted when dry. In *C. riparius* the leaves are obtuse, and either rounded, the nerve disappearing at or below the apex (Fig. 34 E); or there is a small slightly recurved apiculus (Fig. 35 F). The basal cells are more elongated and slightly narrower.

Pending the appearance of an authoritative description of the species, the foregoing remarks may be of some slight assistance to the increasing circle of students in this fascinating branch of botany who may now make search, and not without hopes of success.

W. P. HAMILTON.

Shrewsbury.

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. BRUNETTI.

[*Continued from p.* 39.]

THE Diptera are divided into four primary groups:—

Legs at juncture with thorax contiguous: PROBOSCIDEA.
  Antennæ of many joints (at least six): *Nematocera*.
  Antennæ of only three distinct joints.
    Posterior veins of wing, branched: *Brachycera*.
    Posterior veins of wing, simple: *Hypocera*.
Legs at juncture with thorax wide apart: EPROBOSCIDEA.

NEMATOCERA.

The characters of the Nematocera may be summarised as follows. Body, delicately elongated, legs usually long and slender, antennæ of many joints, flexible; veins in wing numerous, alulæ small, ocelli usually present, anal cell in wing usually open.

The venation in many genera varies in the relative lengths of some of the veins and their respective positions.

Mesonotum with a distinct vertical furrow: *Tipulidæ*.
Mesonotum without such furrow.
  Ocelli present (two or three).
    Discoidal cell complete: *Rhyphidæ*.
    Discoidal cell absent.
      Antennæ half length of thorax. Pronotum brought forward, conspicuous: *Bibionidæ*.
      Antennæ at least as long as thorax. Pronotum normal, conspicuous: *Mycetophilidæ*.
  Ocelli absent.
    Costal vein barely reaching top of wing.
      Antennæ shorter than thorax. Wings, broad; tibiæ and metatarsus broad, compressed. *Simulidæ*.
      Antennæ as long as or longer than thorax. Wings narrow, tibiæ and metatarsus slender, cylindrical: *Chironomidæ*.
    Costal vein attenuated round posterior margin of wing:
      At most six posterior wing cells: *Cecidomyidæ*.
      At least more than six cells.
        Wings ovate; tip pointed: *Psychodidæ*.
        Wings oblong; tip rounded: *Culicidæ*.

1. *Cecidomyidæ.*

Winnertz has elaborately monographed some of the European genera of this group, having devoted twenty-five years to the study of this family. The larvæ are oval, fleshy grubs, feeding on various parts of plants; many form galls, and some live in rotten wood. The pupæ resemble the imago, but are of course wingless.

Degeer and others have observed the transformations of some of the species. The imagos are elegant and delicate small flies, about seventy or eighty species at least being British, though Walker introduces double this number.

Schiner recognises two sub-families.

Fourth longitudinal vein absent: *Cecidomyinae*.
Fourth longitudinal vein present: *Lestreminae*.

Cecidomyia destructor, Say., is the "Hessian fly," which in its larval stage does such extensive damage to the wheat. It is not rare on the continent, devastating at times whole districts, but has seldom been met with in England. It is of a brownish grey colour, with clear wings, elongated abdomen, and long, thin, black legs.

Diplosis tritici, Kirby, is known as the "wheat midge."

The neuration of *Diplosis* resembles that of *Cecidomyia*, except that the vein running towards the top of the wing is usually straight.

Some other enemies of the agriculturist are, *C. brassicæ*, Winn., feeding on rape pods. *C. pyri*, Bouché, feeding on pear trees. *D. centralis*, Winn., feeding on beech.

Westwood figures the larva of *D. pini*, Deg., in his "Class. Ins.," vol. ii. Fig. 125–6, and the pupa in Fig. 125–7. *D. verna*, Curt., Curt. 178. *D. tritici*, Kirby, Curt. "Farm. Ins.," Pl. 1. 8.

2. *Mycetophilidæ.*

The *Mycetophilidæ* are small, delicate flies, resembling the *Cecidomyidæ*. Many of the genera are easily recognised by the difference in venation and the presence of spines on the legs, both of which are good generic characteristics. The larvæ live as a rule in fungi or rotten wood.

Antennæ as long or longer than body: *Macrocera*, Pz.
Antennæ much shorter than body.
  Terminal joint of palpi elongated: *Platyura*, Mg.
  Terminal joint of palpi short.
    Discoidal cell present: *Sciophila*, Mg.
    No discoidal cell: *Mycetophila*, Mg.

The four principal genera may be separated as follows:—

Sciara Thomæ, L., is black, with long thin legs and dark brown wings; long 4½ mm.* The larvæ of this

* Twenty-five millimetres make one inch.

genus do not spin cocoons as do those of *Mycetophila*, and other genera.

Sciophila, Mg., frequents the leaves of trees, herbage and woods.

Mycetophila, Mg., is generally distributed. Westward notices the transformations of one or two species of *Platyura*, Mg.

Bolitophila, Mg., occurs occasionally in mid-winter if the weather is mild.

About 150 species of *Mycetophilidæ* are British, some being tolerably common, but the majority are less frequently met with.

Sciara Thomæ, L., Wlk. vol iii. Pl. xxx. 3. *Platyura flavipes*, Mg., Curt. 134. *Macrocera stigma*, Curt., Curt. 637. *Mycetophila cingulum*, Mg., Wlk. vol. iii. Pl. xxi. 2.

3. *Bibionidæ*.

Most of the *Bibionidæ* are vernal, often appearing in great numbers, the males hovering in the air, their legs vertical. The larvæ are worm-like, living in the earth, on grass roots; the pupa is naked.

Antennæ four-jointed: *Bibio*, Geoff.
Antennæ eleven-jointed.
Palpi long: *Dilophus*, Mg.
Palpi short: *Scatopse*, Geoff.

Bibio Marci, L., a rather large black fly, appearing in March; abdomen elongated, legs rough and hairy; wings clear in ♂, brown in ♀: transformations known; long 8 mm.

Dilophus febrilis, L., is a smaller species, not unlike the above, and is sometimes taken in winter. In its larval state it infests the potato; a correspondent of mine bred it from *Calceolaria*.

Scatopse notata, L., is a small black fly, often common in houses in the summer and autumn; the wings are large and quite clear, the legs rather short, long 2–3 mm.

Bibio venosus, Mg., Curt. 138. *B. Marci*, L., Wlk. iii. Pl. xxx. 5. *Scatopse bifilata*, Hal., Wlk. iii. Pl. xxiv. 6.

4. *Simulidæ*.

These are often known as "sand flies" (*Simulium*, Lat.), and sometimes are as numerous and as great a source of annoyance as mosquitoes. The larvæ of some species are aquatic, the wings of the imagos emerging from the pupa case beneath the water.

Only two species are British; both uncommon. Walker gives five species (three being repudiated by Verrall), whilst Curtis mentions no less than thirteen as indigenous.

5. *Chironomidæ*.

A large number of species are British, but they have not yet been satisfactorily worked out. The species in most instances are fairly distinct, but owing to the lack of published matter, exceedingly difficult to identify.

Walker describes the larvæ of two common species.

They are known as "mosquitoes," and are small delicate flies, with clear wings and indistinct venation, the males having large feathery (plumose) antennæ. No ocelli. They are common of an evening, usually hovering in small swarms under trees and over bushes.

Chironomus plumosus, L., is the common "mosquito," the larva being aquatic, blood-red, living in stagnant water.

Winnertz has elaborately monographed the genus *Ceratopogon*, Mg. (known as midges).

The two principal genera may be separated thus:—

Metathorax produced over base of abdomen: *Chironomus*, Mg.
Metathorax short, descending to the posterior coxae: *Ceratopogon*, Mg.

The bodies of some species of *Tanypus* are almost transparent, and most of the species have spotted wings. They are distinguished from *Chironomus* by the apex of the discoidal cell giving forth four veins instead of three.

Clunio marinus, Hal., a rare species, has coriaceous wings, and is found on the sea-coast.

Chironomus plumosus, L., Wlk. iii. Pl. xxx. 4. *Tanypus nebulosus*, Mg., Curt. 501.

6. *Orphnephilidæ*.

Orphnephila testacea, Ruth., has occurred in Britain. It is a rare species.

7. *Psychodidæ*.

These are small, blackish-grey, pubescent, moth-like flies, with very large scaly wings fringed at the edge, and pointed at the tip. The larvæ are aquatic. (Two common species live in cowdung.) One species, *P. phalænoides*, L., being very common, occurring in London all through the summer months; easily recognised by its zigzag movements on the windows. *P. sexpunctata*, Curt., is not uncommon, being easily recognised by the six small but distinct black spots along the front border of each wing. One or two species appear in mid-winter.

P. sexpunctata, Curt. 745.

8. *Culicidæ*.

The too well-known "gnat," *Culex pipiens*, L., is the type of this family.

The larvæ (figured by Westwood) are aquatic, and active, the eggs being glued together in the form of a boat. Degeer and others have well worked out the life-histories of several species. The pupa is active, but takes no nourishment.

The *Culicidæ* may easily be recognised and separated from the *Chironomidæ*, to which they bear some resemblance, by their wings being fringed, and the venation being more distinct and more complicated.

The proboscis is long and powerful, composed of seven pieces. No ocelli.

Stephens, some years ago, monographed the British species, which are nearly twenty in number.

Aedes cinereus, Mg. The only known species. Found in marshy spots. Larva aquatic.

Culex, L. The ♀ lays about 300 eggs, the imago requiring a month to acquire full development.

Anophiles, Mg. Rare; the ♀ does not suck blood.

Corethra, Mg. The larvæ of *C. plumicornis*, F., and *C. culiciformis*, Deg., are well described by Walker.

Mochlonyx, Liv., has been recorded as British.

9. *Dixidæ*.

These flies are closely allied to the *Tipulidæ*, with which a recent authority (Van der Wulp) classes them. They occur in woods, and on the banks of streams, usually appearing in the evening.

The larvæ live in fungi and decaying wood. Only two or three species are British, and *Dixa* with *Orphnephila testacea*, Ruthé, forms the group *Heteroclitae* of Walker—both being placed by Schiner with one or two other allied genera as a group of "uncertain position." Curt. illustrates *D. nebulosa*, Mg. (409.)

10. *Tipulidæ*.

Over 150 species of this family are British, most of them being known generally as "daddy long-legs."

They are very delicate in structure, though many attain considerable size—the legs of the largest species when outstretched spanning a greater surface than those of any other species of Diptera. They should be pinned immediately after death, especially if it is desired to set them.

The legs and bodies are much attenuated. The larvæ of some species are aquatic, whilst others feed on plants or rotten wood. The larva of *Tipula oleracea*, L., does immense damage to grass lands.

Most of the genera may be easily distinguished by the venation. There are three sub-families.

Anal vein absent: *Ptychopterinæ*.
Anal vein present.
- Mediastinal vein ending in the costal, connected with subcostal by a cross vein; last joint of palpi shorter or barely longer than two preceding joints together: *Limnobinæ*.
- Mediastinal vein ending in subcostal, no cross vein; last joint of palpi longer than three preceding joints together: *Tipulinæ*.

1. *Ptychopterinæ*. *Ptychopteryx*, Mg., frequents aquatic plants. They are pretty flies, with the wings generally marked with brown; the species are rather more stoutly built than the *Tipulinæ* and *Limnobinæ*. *P. contaminata*, L., and *P. albimana*, F., are not uncommon.

2. *Limnobinæ*. *Limnobia flavipes*, F., is brown, with pale grey posterior borders to abdominal segments. The wings are grey, with lighter patches, brown veins and a row of brown spots on anterior border; legs grey, with black rings on femora and tibiae. Long 6 mm.

Limnobia occurs chiefly in woods and fields.

Dicranomyia chorea, Mg., is very common, occurring in London all through the summer. It is yellowish brown, legs pale brown, wings clear, with a brownish spot on the stigma. Long 6–7 mm.

Trichocera regelationis, L., is common everywhere, occurring in London houses all through the warm weather. It is a slender, blackish-grey fly, with pale grey wings, and long, thin, blackish-grey legs. Long about 4 to 6 mm.

3. *Tipulinæ*. *Tipula oleracea*, L., is very common, the species of this genus being very widely distributed. *T. oleracea*. Tawny grey, tinged with grey—sometimes wholly grey, with long tawny legs and grey wings, and is common everywhere; known familiarly as the "daddy long-legs." Long, about 14–15 mm. Variable in size.

Ctenophora, Mg., is a limited genus of large, handsomely coloured flies, all more or less rare, and more stoutly built than the rest of the *Tipulidæ*.

They seem to me to be partly allied to *Ptychoptera*, Mg. The antennæ are deeply pectinated in a different manner in each species.

Ptychoptera contaminata, L., Wlk. iii. Pl. xxviii. 7. *Dicranomyia stigmatica*, Mg., Wlk. iii. Pl xxvii. 2. *Tipula longicornis*, Schum. Curt. 493. *Ctenophora ornata*, Mg., Curt. 5.

11. *Rhyphidæ*.

The *Rhyphidæ* pair in the air. They live on over-ripe fruit, the larva inhabiting cowdung, or, according to Latreille, in the case of *R. fenestralis*, Scop., moist linen. This species is not uncommon in London (on windows), and is recognised by its wings being prettily marked with brown.

They are allied to the *Tipulidæ*, with which they have by some authors been incorporated, and as a rule are only found singly or in pairs.

R. fenestralis, Scop., greyish-brown, with ashy grey thorax marked with 3 longitudinal dark lines; face grey; eyes and antennæ black; legs tawny brown; knees and tarsi more or less black; wings grey; stigma and one or two clouded spots on fore border, brown—long 7 mm.

MY PET MARMOSET.

In May, 1889, I bought a young marmoset (*Hapale penicillatus*) in Bahia (Brazil), which since that time has been my constant companion, and, consequently, under my observation the entire time.

In spite of its comparatively low intelligence, it has become a most interesting pet; and to watch its ways and habits is a constant source of pleasure and instruction. In Brazil these animals are much valued as pets by the African women settled there; and many a one may be seen adorned with a little necklace, and pair of tiny earrings of gold and coral. The marmoset is naturally affectionate, and it soon becomes attached to its owner.

In the marmoset the emotions of rage, pleasure, and fear are strongly developed. It exhibits three distinct states of rage, the changes from one to the other being abrupt. They are as follows : (1) when slightly agitated (when shown to a stranger, or if any attempt be made to forcibly handle her), expressed by a slight chattering ; (2) a more pronounced stage (when taken up suddenly by the hand), when she chatters vigorously, and attempts to bite ; (3) an extreme stage, when the chattering becomes most vigorous, alternated frequently with shrill barks, and determined attempts at biting, the whole body trembles and is convulsed with fury. I can tell immediately—if I am not in the same room—the state she is in from her cries ; but lately she has entirely given up the third stage, for which I am thankful, as it could end fatally through the intense excitement.

Pleasure is expressed by whistling, and a peculiar little gentle chatter ; when placed in the sun she will assume all sorts of positions, and extend the limbs, in order to literally bathe in the sunlight, and will every now and then give vent to a loud and prolonged whistle from a widely distended mouth. I have been able to produce this state latterly, by imitating her whistle, when she will answer back. She will whistle when she is gently caressed and played with, and she will then be very playful, jumping over your hand in the most eccentric manner, and pretending to bite, every now and then dashing off with tail erect, to return again immediately. At such times she will play hide and seek round a book or some other object with the greatest zest, and when caught face to face will stop short and draw the skin back from the face in a curious manner, as if to make herself smaller, and so invisible.

Fear is expressed by a sharp high whistle, which resembles the screeching made by a pencil on a slate. The sight of a dog will at once cause it to be uttered. She appears much more timid of a dog than of a cat ; but when brought face to face with either will at once assume an attitude of defence, by raising the body on the hind quarters, and preparing to use her fore limbs and teeth. The sight of "Sallie" (the chimpanzee in the Zoo) produced in her the most abject fear, while she seemed anxious to attack all the other monkeys.

A looking-glass always amuses her. When looking at her own reflection she will turn her head round in a most curious manner, as if to examine the reflection from all directions ; this movement of the head will also take place when examining any very strange object. She is very fond of having the scalp raised by the fingers, and of having the long black ear coverts twisted up, and will sit for hours on my shoulder, whatever I may be doing. If left alone for long, she wears a most dejected air, and will, if possible, go to bed. At night time she sleeps in a little flannel bag lined with cotton wool, and it is amusing, as evening approaches, to see how restless she becomes. When released from her perch she will make for the sofa on which is placed the bag, and coil herself into it, only coming out at dinner time for some sweets, and then sleeping until it is daylight again. Should a bell be rung, a faint whistle may be heard from the bed, although she is asleep.

In her habits she is extremely clean and regular. Her staple food is bread and milk, but she is very fond of insects and fruit, and the sight of apricot jam causes great excitement, as she likes it better than anything else. Her weight is nine ounces.

I have never attempted to teach her many tricks, but my aim has been to try to understand her ways ; a better way I think of studying animal nature than by devoting time to teaching tricks—which, after all, are only learnt in a mechanical and vague manner. If we try to understand them, we undoubtedly gain their trust and affection. This timid little marmoset will follow me about like a dog, though I never encourage it.

DAVID WILSON-BARKER.

A VISIT TO THE BRIGHTON AQUARIUM.

By EDWARD A. MARTIN.

IN spite of the care and attention which, in the interest of the shareholders, is devoted towards providing dramatic and musical entertainment for the mental digestion of frequenters of the Brighton Aquarium, the establishment still retains a high position as a scientific collection of one of the most useful divisions of the great vertebrate sub-kingdom. One can scarcely lay blame on the shoulders of the directors that the force of circumstances has compelled them to neglect to a partial extent the true objects for which the collection was founded. All shareholders cannot afford to imitate the example of one of their body, who returned dividends to the amount of a good many pounds in order that the sum might be devoted to the needs of pisciculture. The result of the present policy has been that perhaps not one-eighth of those who visit the Aquarium are in the slightest degree interested in the scientific aspect of the institution, whilst those who are so interested, are content to remain thankful that through the tolls paid by the remaining seven-eighths, they are allowed to retain the place at all as a scientific collection of fish.

It is remarkable that amongst the creatures exhibited there are found representatives of each of the five classes of vertebrates, although the collection is nominally one of the "pisces" only. Yet an Aquarium should be available for the reception of all those creatures which exist in water; and indeed, taken in this its widest sense, it is scarcely to be seen why the authorities have made no effort to introduce other classes among the invertebrates, one of which is notably absent, namely, the molluscs. There would scarcely be anything more interesting than a series of tanks in which were to be seen crawling about on the rocky bed, or over the sandy floor, the inhabited shells of those creatures which we are accustomed to see lying in cabinets and on mantel-shelves, artificially polished, and in many cases in sharp contrast to their dull natural appearance.

Perhaps one of the most interesting tanks is that devoted to the beautiful Guillemots, or swimming birds, although few visitors have the opportunity of seeing them at their best. This is at their feeding time, when they exhibit their wonderful powers of diving. When the surface of the water, as seen from below, is perturbed by the almost phosphorescent wavelets, caused by the birds splashing about and cleaving the water at full speed in pursuit of their prey, the sudden transformation of a bird into a fish—for such it almost appears in the water—is a most striking sight, and as it cuts through the surface with its beak, and folds its powerful wings by its side when gliding through the water with the impetus it has gained, it shines with a silver-like glow, as it reflects the rays which illumine it from above. It seems principally to use its legs in its under-water propulsion, its tail doubtless acting the same part as that it plays in true fishes. The bird has been said to remain beneath the surface for several minutes.

The strange lazy mud-fish in its table aquarium scarcely perhaps attracts the attention it deserves, and yet its life-history is a most important one to the evolutionist, since it is one of those animals which supply a found—and not a missing—link between the Reptilia and the Pisces. In reptiles, the process of breathing is carried on by means of well-developed lungs, whilst in the fishes proper, the process of oxygenisation of the blood is brought about by gills, situated on both sides of the head behind the mouth. It is scarcely necessary to repeat the fact that fishes require air just at much as human beings, and that if placed in water which has been boiled (and of course cooled), they cannot live, or that if placed in insufficiently aërated water they can often be seen breathing the air at the surface of the aquarium. In our friend the mud-fish, Lepidosiren or Protopterus, however, there is not only the usual complement of gills as in fishes, but also lungs, as in reptiles, the ordinary swimming-bladder of fishes being in this instance organised as a lung. The happy possession, therefore, of both of these forms of breathing apparatus, enables it to inhale air both directly from the atmosphere, and by abstracting it from the water. In its native haunts it is found inhabiting the rivers on the west coast of Africa. These at certain seasons run quite dry. At such times, when it feels the stream gradually subsiding in which it has dwelt, and the danger threatens of being stranded and exposed to the attacks of its enemies, it has the habit of burrowing into the soft clay forming the bed of the stream, and of there hiding itself in the nest it has formed. As soon as the water has ceased to flow over its place of refuge it commences to breathe by means of its lungs, and remains ensconced in its clayey home, until, with the return of the wet season, the stream again fills up its deserted bed. By taking advantage of this nidifying propensity, the fish was brought to England in the clay in which it had buried itself, and the nest is now to be seen by the side of the aquarium in which the creature lives. It would seem, too, as if it has resumed its fish-like habits permanently, as no provision appears to have been made for it in its confined home, by which it can at all make use of that important organ, its lungs. This is rather to be regretted, as to the general public the novel sight of a comparatively unknown fish living out of water, on a dry soil, would have proved no doubt interesting and entertaining.

Fishes, fossil and recent, are sometimes roughly classified into two divisions according to the shape of their tails. Agassiz, the great naturalist, whose authority on the subject is everywhere recognised, found that some tails were equal-lobed, as in the case of the herring, whilst others, as those of the shark, the skate, and the sturgeon, were unequal-lobed, and consisted of an elongated upper lobe, into which the backbone was continued, the lower lobe being considerably shortened. It is an interesting fact that, although now but very few living fishes have tails of the unequal-lobed form, almost all of the forms of primitive fish-life bore them. During a period preceding that when the chalk was formed, fish with equal-lobed tails commenced to live, whilst the ancient form began to die out. The proportion of one form to the other now, therefore, is reversed, whereas homocercal (equal) tails were formerly the exception, and heterocercal (unequal) tails the rule, now, with the exception of the sturgeon, shark, skate, bony-pike, and perhaps a few others, the far larger proportion are equal-lobed.

The little gar-pike, or bony-pike of the American rivers, which are now in the Aquarium, are the first of their species which have been introduced alive into England. To the energy of Mr. Crane, F.G.S., and his American friends, the authorities are greatly indebted in this matter. The gar-pike exhibit well the ancient form of unequal lobed tail. They attain a length of several feet, and their vertebral column is more completely ossified than any living fish. Their jaws form a long narrow snout, which is armed by a double series of teeth.

Every schoolboy who has lived in a district where the chalk-hills form an important feature in the landscape, has found at some period or other numerous "sharks'-teeth" imbedded in the chalk-pits. They form such a well-known fossil that we can judge, to a certain extent, of the numbers in which sharks lived in those parts when the chalk was being formed beneath the sea. These relics of the monsters of the deep, which then roamed through the sea in our latitudes, remind us forcibly of the great change which has come over the inhabitants of these shores. We have no voracious shark now skirting our British coasts, lying in wait for a meal of man or beast, as he would have done in ages gone by. Our waters are not warm enough for him, and the man-eating sharks, whose ancestors left their bones and teeth on the chalky floor of the northern ocean, have now bid good-bye to these regions, and betaken themselves to a climate more suited to their taste. The only allied fish which now remain with us are the various species of dog-fish. These represent well in structure the most important points in the dreaded white shark, although of course very much in miniature.

The order which embraces the sharks and dog-fishes, also includes the rays and the skates. As I was watching the tank which contained the latter, a large individual came floundering from the recesses of the cavern, and settled itself down on the base of the tank immediately in front of the glass. As it settled it seemed to press its two side fins downwards, and arch its body from side to side, as though to prevent the under surface of its body coming into contact with the ground. I noticed that this occurred each time it settled, so to speak; and I therefore determined to watch its under-surface, as it rose, for an explanation of the position it assumed. An opportunity soon presented itself, and as the creature rose, it showed on the under-surface of its body two series of five branchial openings radiating away from each other and from its mouth. These openings communicated with a corresponding number of branchial pouches, and really constituted its means of breathing. This was the more apparent, since the openings were regularly opened and closed by a covering membrane at intervals of about a couple of seconds' duration. This at once explained the reason of its peculiar attitude when on the floor of the tank.

As we pass along the corridors, the interesting little stickleback claims our attention, and recalls to mind the ingenious manner in which the male builds its nest for the reception of his chosen brides. The gorgeous plumage of the dahlia (Crassicornis) and carnation (Dianthus) anemones appeal to our æsthetic and artistic tastes, and we notice how the latter species have taken to themselves the most prominent projections of the rocks, to the exclusion of all others of its fellows. We notice the tank of silvery little whitebait, shining in the artificial light overhead, and take note of the fact that they have been kept in captivity until they have grown into true herrings. The ugly octopi, with their internal skeleton, familiar to us as the cuttle-bone; the turtles, the affectionate-looking seals, are amongst the many creatures which arrest our attention. We hope fervently that the aquarium will be able to steer clear of pecuniary shoals, as it has done in the past, and that there will be sufficient local spirit to prevent such a national institution from falling a prey to insolvency. If unable to pay its way, perhaps Government might be induced to engraft it on to the Natural History Department of the British Museum, which should carry it on as a seaside branch of itself. Perhaps the Council of the Imperial Institute might be prevailed upon to become interested in it, and save it from any possibility of having to close its doors. Were practical experiments in pisciculture to become the recognised reason of its existence, even Englishmen would not begrudge an occasional Government grant towards its support.

ROSSENDALE RHIZOPODS.

No. 1.

THE wonders of structure and organisation revealed by the Microscope in every department of the vegetable and animal world, form a chapter of intensest interest to the thoughtful mind. On the one hand we see the whole organised creation built up of practically identical elements; on the other, the most varied and wonderful adaptations, in every minute particular, to fit them for their surroundings and mode of life. Wonderful and interesting as these revelations have undoubtedly been, yet the discovery of the Rhizopoda, the Infusoria, and Rotifera—bringing within our ken, as it were, the denizens of a new world—far surpasses, to some orders of mind, all other discoveries. During the past few years, I have devoted special attention to these classes of animals, (particularly the Rotifera), have systematically "fished" a limited number of ponds, taking notes in the field, of my captures, and of the conditions under which they were made, and I propose in this and subsequent papers to embody some, at least, of these notes, in the hope that they may prove of service to those entering upon the study of what is colloquially termed, "Pond Life." As I have now pretty well worked up the Rotifera of Rossendale, so that I rarely come across any form I have not previously drawn and studied, I resolved to do something in the way of compiling a local list, and studying the habits and peculiarities of the humble Rhizopods of our district. From its known richness in microscopic life generally, I fully expected being able to reap a rich harvest of species, and was not altogether without hope of adding some new form, not previously known to science. Another consideration which will naturally recommend this class to microscopists of curtailed leisure, is the fact that it consists only of about seventy species; a number not requiring a great amount of labour in order to get a fair idea of the class. Although I only commenced the special study of the Rhizopoda about three months ago, I have already collected over one-third of the known fresh-water species, so far at least as these are recorded in Professor Leidy's great work; and in addition three or four species apparently unknown to that authority; all in four or five places, within a mile of my own house. In future papers I propose to describe these forms, and to give drawings of the principal varieties, in order to revive an interest in a somewhat neglected class of animals.

The Rhizopoda are microscopic beings, the majority of which are invisible to the naked eye; they are essentially aquatic, being found in ponds, ditches, lakes, marshes, bogs, and in the sea. They appear to have been the first representatives of animal life on earth; and if the theory of evolution be correct, they represent our own remotest ancestors. They constitute a class of micro-organisms of the most simple character; there is no distinction of tissues or organs, but their animal substance is homogeneous, contractile and translucent, resembling a tenaceous mucus or soft tremulous jelly. This jelly substance, in the living state, is constantly changing its form by expanding at one or several points into processes of ever-varying dimensions, arrangement, and number. These are used as organs of locomotion and prehension, and frequently branch. From the appearance of these temporary organs resembling roots, this class of animal has received its name of Rhizopoda, literally, root-footed. Generally speaking, especially in the naked forms, this colourless jelly includes coloured food-particles, principally microscopic algæ in various stages of digestion, and numerous globules, granules, and various foreign particles, such as sand-grains, all of which tend to diminish the transparency of the animal, and often impart considerable colour. The internal portion of the animal appears somewhat more fluid than the exterior, although in no case is there a true membranous covering. The terms endosarc and ectosarc are used to express this difference, which is more marked in the Order Lobosa than in any other. Many of the animals are capable of enclosing themselves in a shell or test of various figure, consistence, and complexity, and such variations serve to separate the Rhizopods into families and genera. The testaceous forms include the charming Foraminifera and Polycystina, the exquisitely beautiful shells of which are formed in the one case of carbonate of lime, and in the other of silica of most glassy transparency; but as these are (with one exception) exclusively marine in their habitats, we omit all further reference to them in these papers. The fresh-water Rhizopods form their tests or shells of a variety of materials; some of a horn-like substance called Chitine, similar to that which gives strength to the integument of insects; others form neat, box-like cases, made up of minute sand-grains or of diatoms, separately or mixed; while another section, having made a further advance in architecture, build up their tests of rounded, oval, or rectangular plates, of chitinous or silicious material, which, overlapping in various ways, form definite patterns. Our district is fairly rich in these charming forms; although the greater number of them are inhabitants of sphagnous swamps. In most of the genera there is a more or less granular spot called the nucleus, which is considered as the centre of vital activity. Many authorities attach great importance to the presence or absence of this organ, but it is, I believe, a fact, that in the lowly organisms we are now considering, it cannot always be demonstrated, and in some cases is undoubtedly absent. There is, however, another organ which is rarely absent—sometimes indeed there are considerably more than one (in Arcella, for instance) viz., a contracting vesicle; this presents itself as a "clear, colourless, or pale roseate sphere, which is observed very slowly to enlarge, then rapidly to collapse, and for a moment to disappear, again to reappear, commonly in the same position." This occurs with a certain degree of regularity. The phenomenon is remarkable, and probably serves a respiratory, and possibly an excretory function.

A few words on classification, which is simple, and easily mastered, will suitably conclude this introductory paper. The class is divided into five orders: Protoplasta; Heliozoa; Radiolaria; Foraminifera; and Monera. The first order is divided into two sub-orders, Lobosa and Filosa; the former with thick, finger-like, or lobose processes or pseudopods; the latter with filamentous or thread-like pseudopods. The fresh-water Rhizopods are, with one or two exceptions, contained in the first two orders. Protoplasta lobosa has eleven genera and about forty-three species, and contains such well-known forms as Amœba, Difflugia and Arcella; P. filosa has six genera, and about seventeen species, many of them most charming animals, having most beautifully built-up tests; Heliozoa contains eleven genera and about fifteen species. While the order Foraminifera has but two fresh-water species, Gromia turricola and Biomyxa vagans. Monera, constituted by Haeckel to contain those Rhizopods destitute of nuclei, may be discarded, as many of the forms for which it was created (Foraminifera, &c.) have been proved to be nucleated. This gives us thirty genera, and about seventy-seven species. I have little doubt, however, from my own limited experience, that this number might be materially increased if Microscopists would only pay some attention to this interesting but neglected class of animals. In my next contribution, I propose to describe the Rossendale forms of the naked, lobose Protoplasts.

J. E. LORD.

Rowtenstall.

THE CARBONIFEROUS LIMESTONE OF SCOTLAND.

By Chas. Wardingley.

THIS group of rocks has been variously termed "Encrinital," "Productus" and "Mountain" imestone, and in every case the synonyms have been characteristically applied. The broader term "Carboniferous" is, however, to be preferred, as it will more appropriately include all the varieties of limestone deposited between the close of the Old Red Sandstone period and the commencement of the Permian. The group is decidedly one of the most interesting of the fossiliferous deposits of Scotland, and besides, affords an excellent field of study to the practical geologist. Outcrops occur in the large area extending from the north-east of Fife to the south-west of Dumfries. In these counties, and in Roxburgh, Haddington, Edinburgh, and Linlithgow, it appears chiefly—as in England, capping the various hills and ridges, having to a considerable extent escaped by its hardness the denuding and wasting influences which have worn down the more friable sandstones. Compact and durable, it has offered the sternest opposition to the destructive powers of air, frost, and rain, with this result, that while representatives of other formations have been levelled to its base—the Carboniferous Limestone still stands boldly and sharply out, its peaks and ridges appearing to bid defiance to the conquering power which has worked such havoc among less resisting strata.

To the student of geology the group is probably the most unmistakable of the stratified rocks, and yielding as it does a large variety of economic products, its industrial importance can scarcely be over-rated. For the convenience of those who may at any time desire to investigate the rocks for themselves, we may divide the field occupied by the Carboniferous Limestone into two sections, the Forth district, and the Dumfriesshire district. The former affords the greater number of accessible exposures, and besides its geological features presents many other attractions equally interesting to the tourist of scientific tastes who desires to indulge in a variety of out-door studies.

The above rough sketch introduces us to the limestone exposures adjacent to or within the Forth district, where the beds lie either immediately above the Lower Coal Measures, or alternatively above the Calciferous Sandstone Series. The total thickness of the beds does not exceed 90 feet, even including the freshwater deposit familiarly known as the Burdiehouse Limestone. This is a great contrast to the enormous thickness of the limestone of England, where in several places, notably Ashbourne, in Derbyshire, the total depth is over 1,500 feet. The main mass of the Scotch limestone usually occurs in thick beds, with but little shale between, and with few exceptions is of the grey colour so familiar to geologists who have worked the limestone deposits on the south-western slopes of the Pennine range at Chatburn, Clitheroe, and Whalley. Possibly the best and most typical exposures will be found in Fife, at Invertiel, $1\frac{1}{2}$ mile west of Kirkcaldy, and again at Charleston, 5 miles west of the northern terminus of the Forth bridge. At Invertiel it is seen lying upon the Calciferous Sandstone, cropping out some 70 or 75 feet above the level of the sea, with the strike running from N.W. to S.E. and with an E.N.E. dip angle of 15°. The thickness of the exposed limestone is about 30 feet, and for the greater part consists of massive compact layers interspersed with thin seams

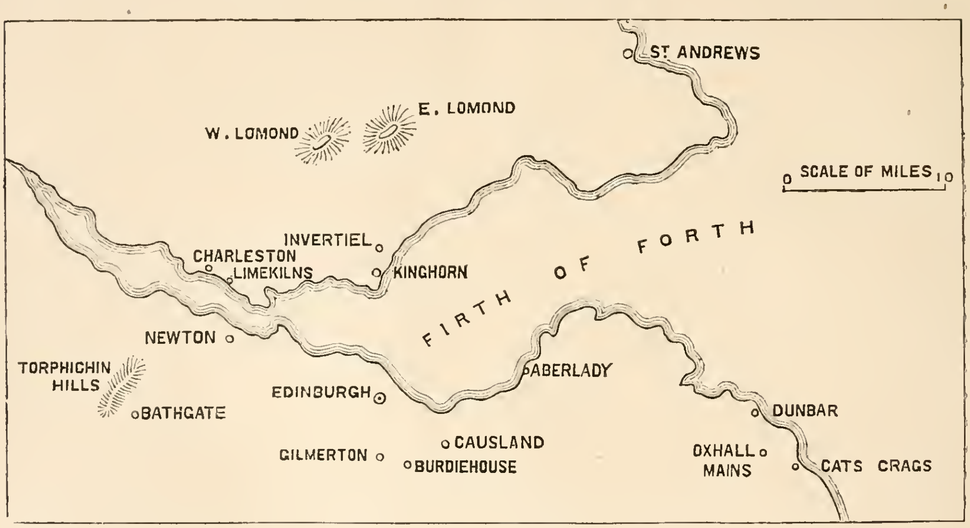

Fig. 36.—Map showing Carboniferous Limestone exposures in the Firth of Forth district.

of darker-coloured calcareous shales. Mineralogically considered the rock is sub-crystalline, with an irregular or amorphous cleavage, and not unfrequently exhibits a splintery fracture, while its general hardness may be taken at 2·8 and its specific gravity at 2·5. It effervesces rapidly in acid, is almost infusible before the blowpipe at an ordinary heat, though it parts with its carbonic acid very readily, shines with a vivid brightness, and ultimately becomes quicklime. The following may be accepted as a rough analysis of the limestone proper.

Carbonic acid	42·0
Lime	48·0
Magnesia	2·0
Alumina	2·0
Silica	3·5
Various (sulphur, oxide of iron, &c.)	2·5
	100·0

The rock generally has the appearance of being built up or composed of Entrochi (wheelstones) or

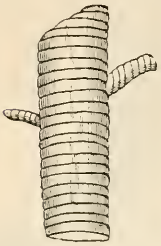

Fig. 37.—Stem of Entrochi.

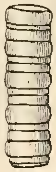

Fig. 38.—Stem of *Platyorinus lævis* (nat. size).

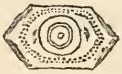

Fig. 39.—Plate of *Archæocidaris urii* (nat. size).

Fig. 40.—Joint of Encrinite ("St. Cuthbert's Bead") (nat. size).

remains of Encrinites, a variety of Crinoid wonderfully numerous in this formation. These marine animals closely resembled plants, hence the name "stone lilies," and, like plants, were fixed to one spot.

They consisted of innumerable articulating joints placed one above another upon a base or root attached to the sea-bottom. This stem, often several feet in length, was surmounted by a cup-shaped arrangement (pelvis) containing the body of the animal, from which issued long jointed tentacula or fingers, capable of being extended horizontally for the purpose of allowing it to catch its prey. Not unfrequently the stems consisted, as in the species Moniliformis, of several thousand Entrochi or joints, and through the whole series ran an alimentary canal connecting the base with the stomach. The holes in the joints caused by the existence of this canal suggested to the former inhabitants of some limestone districts the idea of their having at one time been beads, and indeed they have often been used as such. It is to these that Sir Walter Scott alludes in "Marmion."

"On a rock by Lindisfarn,
St. Cuthbert sits and toils to frame
The sea-born beads that bear his name."

Myriads of these Encrinite stems and joints, the latter varying in diameter from a line to an inch, are crowded into the limestone of Invertiel and other places, though the most perfect examples are those found in the looser calcareous shale. The Encrinite is never found entire at this and adjoining quarries, but bases and parts of the pelvis and tentacula are by no means rare. Other characteristic fossils found here include, *Cyathocrinus planus*, *C. tuberculatus*,

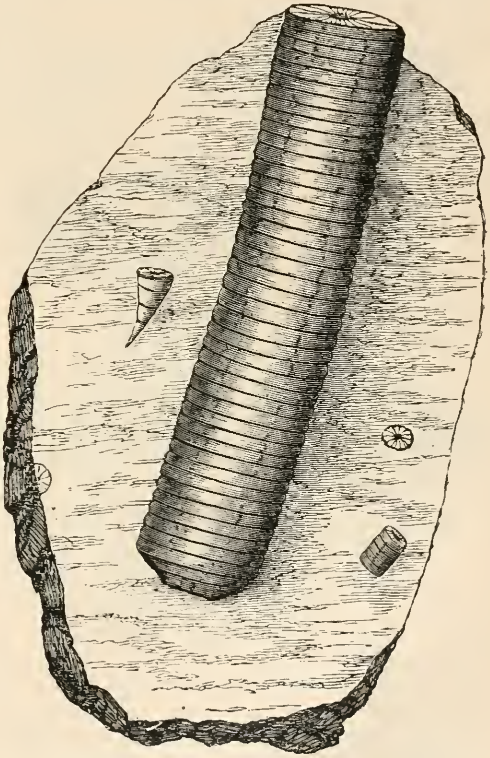

Fig. 41.—Stem of *Poteriocrinus crassus*. (From Taylor's ("Common British Fossils.")

C. rugosus, *Platycrinus lævis*, *Poteriocrinus tenuis*, *Cyathophyllum turbinatum*, Plates of *Archæocidaris urii*, *Fenestella membranacea*, *Productus longispinus*, *P. semireticulatus*, *Spirifera lineata*, *S. glabra*, *S. trigonalis*, *Orthis Mitchilini*.

The plates of the Archæocidaris are usually found singly in the looser shale, and are highly interesting as being the remains of one of the very earliest forms of the family *Cidaris* (*Echinodermata*). These will probably be far better understood by breaking in pieces and comparing the separate sections or plates of one of our estuarine echinoderms, say the *Echina sphæra.*

It may be mentioned that on the shore within a mile from this quarry is an excellent illustration of the change which a sedimentary rock undergoes by contact with an igneous one. In a narrow stretch of coast-line not more than a furlong in length we have a sandstone gradually developing into a quartz rock, yet so imperceptibly does the change take place as to completely defeat any attempt to locate the spot at which the sandstone ends and the quartz rock begins.

Directly north of Invertiel, about 15 miles distant, is the East Lomond Hill, rising 1,471 feet above the level of the sea. The lower and middle portion of this hill, which was in 1881 one of the chief stations of the Ordnance Survey, is composed of Calcareous Sandstone, representing probably some of the lower beds of the English carboniferous rocks, but at the height of 1,200 feet the limestone crops out and forms

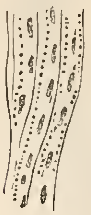

Fig. 42.—*Fenestella membranacea.*

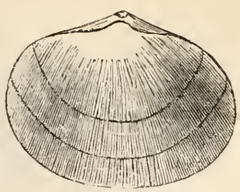

Fig. 43.—*Orthis resupinata.*

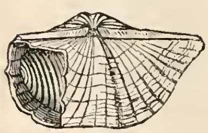

Fig. 44.—*Spirifera trigonates,* showing internal coil.

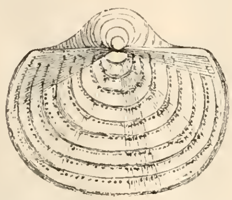

Fig. 45.—*Productus punctatus.*

(From Taylor's "Common British Fossils.")

a belt over 12 feet thick, the rock inclining gently to the south-east.

It is worthy of note that this is one of the highest situated exposures in Scotland from which fossils have as yet been obtained. In many places the limestone is quite bare, with no soil or covering above it, and yet from a thin bed of stone or "blae," quite a large number of shells may be seen, of forms varied and perfect, and but little injured or weathered by their long exposure to the atmosphere. They, however, usually break whenever an attempt is made to extract them from the matrix, and it is only by exercising the greatest perseverance and patience that fairly good specimens of any of the numerous forms of Productus, Spirifera, Rhynconella, etc., can be carried away. Over a century ago this hill was worked for lead, which in the form of galena also yielded silver. The ore, now unprofitable for working, was massive and in hexahedral crystals.

In the west of Fife are the limestone quarries of Limekilns and Charleston, about a mile apart. At the former place the rock was worked so long ago as the 17th century, and must have been an important article of industry and commerce even fifty years ago. Its value to this once thriving village may be better understood by mentioning that from 1840 to 1850 the average annual output of limestone exceeded

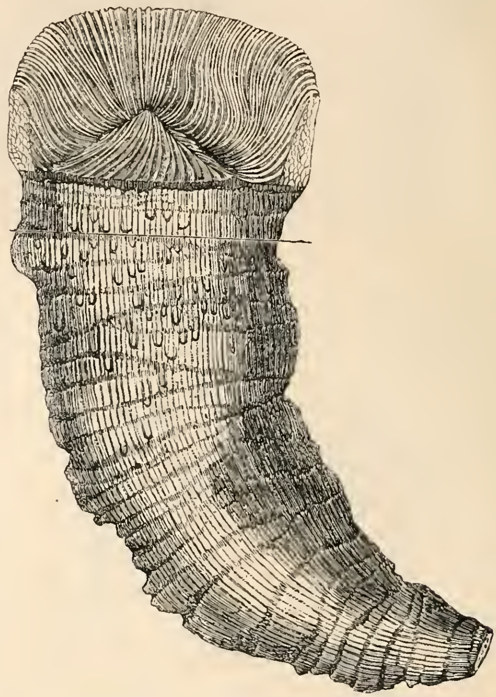

Fig. 46.—Clisiophyllum. (From Taylor's "Common British Fossils.")

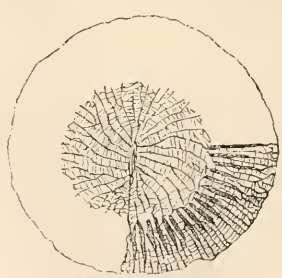

Fig. 47.—Transverse section of Clisiophyllum.

15,000 tons, while the value of the raw material previous to burning and shipment amounted to nearly £4000. The rock has been wrought from the face of the outcrop, north-east to south-west, and very close to the shore. Step by step the workings have been carried westwards towards Charleston, the site of the present very restricted operations. The result is that the appearance of the coast-line for upwards of a mile has been altogether changed. Instead of a gradually rising shore or "talus," we have a thin stretch of undulating ground, backed by a steep precipitous ridge or cliff in several places upwards of 120 feet high. This is one of many such examples which help to show us how very greatly the aspect of a locality may be permanently changed by mining or quarrying operations conducted from the surface. The exposure consists generally of several beds of limestone dipping to the north-west at an angle of 12°, the visible depth being about 60 feet. These beds in their turn are covered by 35 feet of shale more argillaceous than carboniferous in its composition. The limestone in appearance is very similar to that already described, the colour perhaps being a shade darker owing to the presence in the rock of a small percentage of naphtha. Organic remains are somewhat rare in the lower beds, but of those occasionally found most are in a fairly satisfactory state of preservation. The upper massive beds yield good and large *Productus longispinus*, *P. sinuatus*, *P. martini*, and *P. fimbriatus*; the thin beds of calcareous shale contain species of *Tubipora*, *Cyathophyllum*, *Clisiophyllum*, *Turbinolia*, *Fungites*, (sheep's-horn), and various parts of dispersed encrinites; while from the nodules of red-coloured argillaceous ironstone found in the upper "blaes" the writer has obtained very perfect and well-defined specimens of *Conularia quadrisulcata*, *Orthis resupinata*, *Spirifera lineata*, and *Strophomena sp.*

On the south side of the Forth we have the rock again exposed in the quarries north-east of the important mining district of Bathgate. The ridge or series of hills locally known as the Torphichens form part of the south rim of the Forth basin, and rise to a height of 600 feet above the sea-level. The limestone in this neighbourhood consists of a series of beds 60 feet thick, is of the usual grey colour, but somewhat softer in texture, yielding more readily to weathering influences, and becomes of a black-yellow tint on decomposition. Possibly to the student just commencing his researches among the Carboniferous limestone no better locality than that of Bathgate could be desired, as the exposures are both numerous and easy of access, while the profusion of organic remains is such as to lend every encouragement to those who desire to wield hammer and chisel to advantage. At present, operations in the once extensively worked quarries are all but stopped in consequence of the small demand for lime and the keen competition of more favourably situated lime-works. But it is impossible to wander among the various workings without noticing on every hand signs of the great amount of material which has been extracted. Lead was at one time obtained here in small though not very continuous veins, and this in turn yielded a small percentage of silver. The argentiferous ore was long worked in one of the quarries still bearing the name of "Silver Mine," situated a few hundred yards north-west of the

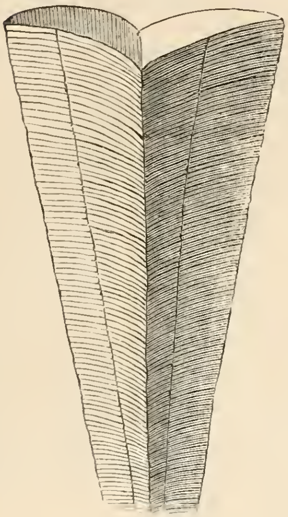

Fig. 48.—*Conularia quadrisulcata.*

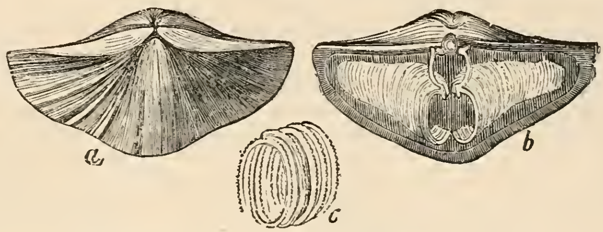

Fig. 49.—*Spirifera striata*, *b* and *c* showing internal coils.

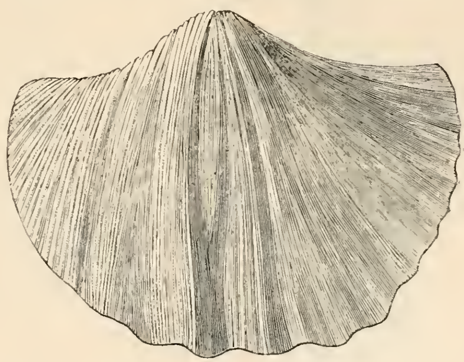

Fig. 50.—*Productus giganteus.*

(From Taylor's "Common British Fossils.")

reservoir immediately above the town, and near to the Bathgate and Linlithgow road. After yielding a comparatively large quantity of silver it ultimately ceased to give a supply great enough to be remunerative, and operations at length were suspended. In 1871 further explorations were made, and several deeper pits with numerous ramifications opened, but beyond obtaining a small and unsatisfactory amount of lead, silver, and platinum ore, the venture was unsuccessful, and the place was finally abandoned. Evidence was, however, adduced during the search, which proved conclusively that the same vicinity had been worked for silver so far back as the 15th and 16th centuries. The specimens now to be obtained comprise barytes (heavy-spar) calc-spar, pearl-spar, and dolomite, while a closer examination among the seams of friable limestone will be rewarded by the discovery here and there of small pieces of lead ore, zinc ore, and pyrites. The fossils, as we have already mentioned, are very numerous, and almost every stone wall in the immediate neighbourhood bears witness to this statement. But while the specimens are so

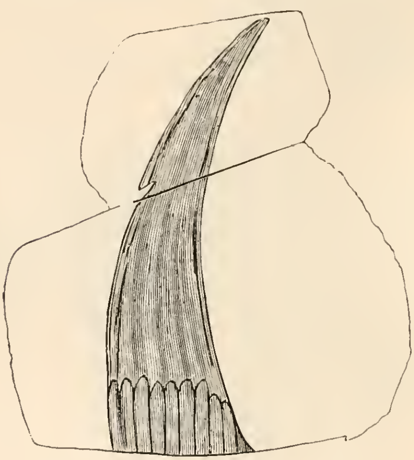

Fig. 51.—Tooth of *Rhizodus Hibberti.*

very general it cannot be said that the species are proportionably varied. *Productus giganteus*, *Cyathocrinus planus*, and *Platycrinus lævis* are unusually common, the first mentioned being present in such quantities as to cause the rock to be well qualified for the name "Productus" limestone. In fact, it seems more abundant here than in any other series of quarries under our notice, but it is unfortunately very difficult to extract. Other fossils obtainable include *Spirifera striata*, (comparatively rare in Scotland), *Productus semireticulatus*, and the Polyzoa *Fenestella membranacea*.

Before taking leave of the carboniferous limestone of the Forth district, it is necessary for us to consider briefly a sub-deposit exposed at Burdiehouse, Newbigging, and other places, to which the terms "Encrinital," "Productus," and "Mountain" would be altogether inappropriate, but which must certainly be included under the term "Carboniferous." This deposit, commonly known as the Burdiehouse Limestone, was first brought prominently before geologists by the late Dr. Hibbert in 1835. It has a dull, earthy, light blue appearance, is exceedingly hard and brittle, breaks with a conchoidal fracture, and the beds vary in thickness from 20 to 30 feet. Where found, it usually occurs alternating with oil-producing shales, directly above the calciferous sandstones, and to a limited extent contains fossils common to both rocks, notably *Sphenopteris affinis* and *S. bifida.* From the nature of the embedded remains it has been considered to be of fresh-water or estuarine origin. Remains of microscopic crustacea closely resembling in general structure those at present existing in fresh-water lakes abounding in decaying vegetable matter, occur in myriads. Teeth of ganoid fish, *Rhizodus Hibberti*, and of *Callopristodon pectinatis*, and *Nematoptychius sp.* are occasionally found, the first-named being usually very perfect.

Though this formation is particularly enticing to the palæontologist, it may not be altogether out of place to warn the student against building up a too exaggerated idea of what he may be able to obtain from the rock during a chance visit of two or three hours' duration. It is quite possible that he may succeed in becoming the possessor of a good-sized specimen of tooth of Rhizodus or other fish, but it is equally probable that he may have to remain satisfied with less enticing relics, made up, perhaps, of some of the more common fern remains. If, however, the place visited be Burdiehouse itself, he will be able to find something to reflect upon during his journey back to Edinburgh (five miles) by knowing that the quarry and its contents have been studied by the eminent geologists, Sir Roderick Murchison, Hugh Miller, Agassiz, and Drs. Fleming and Buckland.

(*To be continued.*)

FAMINE IN THE LAND.

We may gather from the accounts and papers and "Imperial Gazetteer" that the following were years of famine in India:—1396 to 1407, 1460, 1520, 1629–31, 1650, 1686, 1746, 1755, 1759, and 60, 1770, 1773, 1783, 1790–92, 1803, 1807 and 13, 1824, 1833, 1838, 1845, 1847, 1854, 1860 and 61, 1866, 1869, 1873 and 74, 1876–1878. In the Delhi market the price of wheat, according to Mr. Stanley Jevons, was highest in 1763, 1773, 1783, 1792, 1803, 1809 and 12, 1820 and 26, 1834; between which dates and the sun-spot series there is a more or less exact coincidence, some local displacement being marked by the years 1792 and 1872. Famines in India, then, may be expected at the epochs of most and fewest sun-spots, and corn in particular, where grown, may be

A LEAF FROM THE BOOK OF FATE.

Written in the Sun-Spots.

"Decidimus quo pius Æneas quo dives Tullus et Ancus, Pulvis et umbra sumus."—Hor.

m	324	Alexander the Great dies, 323.	m	742	Ahaz; Tiglath-pileser.
m	335	Alexander the Great, 336.	m	753	Romulus, 754.
M	365	Perdiccas the Third.	M	761	Uzziah and Menahem die, 759.
M	387	Ptolemy, 388.	M	772	Zechariah assassinated, 773.
m	412	Archelaus, 413.	M	784	Jeroboam the Second dies.
m	423	Darius the Second.	m	786	Famine of Amos, 787.
m	445	Tribunicia Potestus, 446.	M	805	Plague in Assyria.
M	453	Date of Daniel.	m	808	Circa, depositions, plague in Assyria.
M	464	Artaxerxes.	m	819	Shalmaneser V. dies, 818.
M	486	Leges agrariæ; Darius dies.	M	838	Joash slain.
M	508	Tarquinius Superbus deposed, 509.	m	841	Jehoahaz died, 840.
m	522	Madness and death of Cambyses.	M	882	Jehoram murdered, 883.
M	530	Cambyses, 529.	m	885	Jehoram dies, 884.
M	574	Tyre taken.	M	893	Famine in Samaria.
m	577	Tarquinius Priscus dies, 579.	m	896	The prophets urge Ahab to battle.
m	588	Destruction of Jerusalem.	M	904	Shalmaneser, 905.
M	596	Aurora Borealis; Ezekiel; Eclipse, 597.	m	907	Elijah's famine; visits Horeb.
m	599	Jehoiakim dies.	M	915	Jehosaphat, 914.
M	607	Nineveh destroyed, 606.	m	918	Ahab.
M	618	Ancus Martius dies.	M	926	Omri.
m	632	Cyrene founded by Delphian Oracle.	m	929	Elah murdered; Baasha died, 930.
M	640	Tullus Hostilius dies; 641, Josiah.	M	937	Binlikhish II. dies, 936.
m	643	Manasseh dies, 644; Amon, 642.	M	959	Rehoboam dies, 958.
M	662	Gyges dies, 663.	M	1014	Solomon, 1015.
m	687	Insurrection in Assyria.	m	1017	"The angel at the threshing-place."
m	698	Hezekiah dies; Assaranadina, 699.	M	1047	"A sound in the mulberry tops."
M	706	Tarentum founded, 707.	M	1058	Saul dies, 1056.
m	709	Deioces; Merodach-baladin deposed, 710.	M	1068	Codrus; Inarchus, 1856.
M	717	Romulus dies.	m	1094	Saul, 1095.
m	720	Fall of Samaria, 721.	M	1256	"The angel at the threshing-place."
M	728	Ahaz dies.	m	1489	Sinai, Burning Bush, and Plagues, 1491.
M	739	Pekah murdered.	m	1709	Joseph's famine, 1707.

This Table is founded on the conception of the periodical recurrence of Famines, and may be extended. The notation employed is the Mean Sun-Spot one of Astronomy, which here represents the Jubilee Years, Prophetical Numbers, and other dark Figures in general. The passage from most to fewest sun-spots is calculated as transpiring every eleven years, the epoch of Fewest (m) being indicated eight years after each maximum (M).

expected to rise in price. Locusts multiplied in 1812 and 13, 1822, 1834, 1843 and 44, 1865, 1868 and 69, 1877–79, that is at the period of fewest sun-spots, a rule that appears to hold good for the entire Northern Hemisphere. I once endeavoured to ascertain the destructive species, but could meet with no corresponding enthusiasm in the matter. According to Toaldo, the price of wheat in Lombardy was highest in 1685, 1690, 1693, 1696 and 1700, 1709 and 1715, 1722, 1729, 1735, 1739, 1743 and 47, 1756, 1759 and 63, 1766, 1773, 1778; dates which will serve to show how a general law locally varies.

Horace hears the winter breakers pounding the sea cliffs, and scolds Leuconoe for trying the Babylonian numbers, and chaunteclere has been known to twit Madame Pertelote as being at the root of the matter. But when the air grows soft on the springing corn we need no longer sigh over the hidden fate of Romulus, Tullus, or Ancus, for these dire numbers stand in the margin of everybody's Bible, could anyone suggest how to consult them to any profit. Certainly if we commence B.C. 588 and add eight and three alternately we may calculate out a very perfect table of destiny for the kings of Judah and Israel, so that like some warning prophet we might have loomed on each in turn and propounded the alternative of a seven years' war, a famine, a distemper or an abdication; or we may if desirable begin B.C. 1014 and compute by adding the sevens, but in this case the dates will be less nearly approximated. Proceeding by either method, we infallibly arrive at one or the other of the cardinal dates of the Prophet Daniel employed in astrological predictions, and continuing down to our own times, it will become self evident that the Jubilee dates of the Bible, taken as they stand, represent the mean series of most and fewest sun-spots. Possessing such a table, we shall awake to the same dark shadows playing everywhere over the open page of history, notably embodied in the rush of the barbarians over the rustling corn-lands of the west at the decline of the Roman Empire, a battle-cry of famine, nowhere so photophoned as in the burden of the valley of Jehosaphat, when the earthquake roars and the sun dons its noontide sackcloth; 'Hamonim, harmonim, bemek hacharutz,' whose refrain as the moon arises red we catch in 'canes ululare per umbram.'

'We are seven,' said Wordsworth's smart schoolgirl: they are seven, was then the dark song of fate; the child sneezed its seven times. But there must have been room for a range of opinion, for on one of the Assyrian signets the king stands before his burning tree crowned with the seven-rayed sun, which has the adjunct of eight pomegranate-like side cressets, and so very confident is he in his arrangement, that he holds what looks like a bell-rope communicating with the Deity, in apparent disregard of a priest opposite, who tugs just such another; the reverse is seen in the resourceless monarch who weeps over the face of the prophet exclaiming, 'O thou chariot of Israel and horseman thereof.' Two arrows fly to glitter in the sun, five or six blows are struck on the land of milk and honey, though the medieval alchemist would have transmuted all to gold from spirits four and bodies seven, and Josephus thinks that the arrows were necessarily three. Is this thy place, sad city, this thy throne, where the wild desert rears its craggy stone, while suns unblest their angry lustre fling? we feel ever ready to exclaim, inured to the smooth, uneven, star and planetary stops of a brilliant millennium, that warms in the sun, refreshes in the breeze, glows in the stars, and blossoms in the trees; though even in our green native lanes, far remote from throne or senate, we do all unawares encounter the white-winged angel as our destiny, in the shape of a barking cough, bronchitis, rack of nerve or muscle, prelusive of the end. On the 29th of April, 1882, it was truly painful to behold the seared and blooming cheeks of nature, the greenwood scorched and withered on its southern aspect, as though scathed with flames, or languishing in the breath of autumn that benumbs the bumbles on the thistle tufts. The aristocratic elms stood like ragged foresters rayed half green, half umber; the horse-chestnuts and hawthorns showed piteously their white china flowers from among sienna leaves; the oaks in flower and leaf looked as though hung on the sunnier side with charred paper, leprous with an orange fungus; the limes and sycamores had their leaves shrivelled. In the neighbourhood of the tropics these stormy winds whirl the dust-storms over hot sands, in their furnace breath the top of Carmel withers, there is a galloping in the trees, the locusts teem, and the five-and-twenty prophets come forth to gaze at the sun arising on Olivet, and exclaim, 'This is the cauldron and we are the flesh.' The Indian statistics show that behind a drought does not necessarily stalk a famine, but Mallet's tables render it perfectly clear that eruptions and earthquakes occur in spells at the epochs of most and fewest sun spots. In vain was Catherine mangled and borne through mid-air to saint a Sinai that does not glow, for the gentler sex remain of opinion that a blazing mountain admonishes the earth; Proserpina has left us a nosegay, and Agatha her veil, such were ever the resort of the prophet and the seer in evil times. According to an author quoted, Julianus states that in the reign of king Theodoric, when his wife's grandfather was returning by sea from Sicily to Italy, the ship stopped at one of the Lipari islands, where a hermit told him that Theodoric was dead. The hermit knew the fact from having seen the king, on the previous day, dragged between John the Pope and Symmachus the patrician, ungirt, unshod, and in chains, and thrown into the crater of the volcano. The kinsman of Julianus made a note of the day, and found, on his arrival in Italy, that Theodoric had died at the time of the appearance described by the hermit. It may be remarked that John and Symmachus had been put to death by

Theodoric; albeit the date 526 A.D. is fatal, and the coincidence certainly striking. It is a little singular that Professor Sayce, in translating the allegory of Bel and the Dragon, should not have recognised in it a base version of the Jewish lawgiving, the Assyrian tables being of moral import and not of moral weight, the shadow and fruit of that golden tree whose gay visions of the earth's childhood are still the bane and perdition of our modern culture. The meteorology and geology patched together infallibly outlines in barbarous hauruspid style the ruddy clouds, the lightnings, the belching, the red lava, and the terrific reflexion of the volcano. 'None among the gods surpasses thy power; as an adornment he has founded the shrine of the Gods, which is become thy home, O thou that avengest us. May thy destiny, O Lord, go before the gods, and may they confirm the destruction and the creation of all that is said. Set thy mouth, may it destroy the plan; turn, speak to him, and let him produce again his plan. Go, they said, and cut off the life of Tiamet; let the winds carry her blood to secret places. They showed his path and they bade him listen and take the road. He made the club to swing, the bow and the quiver he hung at his side; he set the lightning before him, with a glance of swiftness he filled his body. She recites an incantation, she casts a spell. Bel made an evil wind to enter, so that she could not close her lips. The violence of the winds tortured her stomach, and her heart was prostrated and her mouth twisted. He swung his club, he shattered her stomach, he cut out her entrails; he mastered her heart. The elevenfold offspring are troubled through fear. And he took from him the tables of destiny. He lit up the sky, the sanctuary rejoiced. Bel measured the offspring of the deep, he established the upper firmament as his image.' In Syria during a famine when a change of dynasty was contemplated, a prophet, we are told, resorted to a cave in Mount Horeb. A strong wind rent the mountains and brake in pieces the rocks before Jehovah; after the wind came an earthquake and after the earthquake a fire; when Moses ascended Sinai at the delivery of the law, 'the smoke thereof ascended as the smoke of a furnace, and the whole mountain quaked greatly.' It is the precedent to cast dates from an Astronomical canon: that of the Alexandrine astronomers gives the following dates for the kings of Assyria, commencing at Cyrus, B.C. 538, 555, 559, 561, 604, 625, 647, 667, 680, 688, 692, 693, 699, 722, 724, and 729; the one enclosed will cast with but small deviation and error those of Israel and Judah. If winds and earthquakes are regarded, then, as an expression of the Divine will, and these are found to be in turn caused by the sun; it is difficult to see how the sun and stars can be excluded, save there exist some incomprehensible distinction between judicial cosmology and judicial astronomy.

A. H. SWINTON.

SCIENCE-GOSSIP.

WE would draw the special attention of our readers to an article in the last number of the "Annals and Magazine of Natural History," by Professor Rukenthal, "On the Adaptation of Mammalia to Aquatic Life." He believes the toothed whales and the whalebone whales have each had a separate origin and development.

THE last number of the *Feuille des Jeunes Naturalistes* has a capital and comprehensive article by M. Billet on "Notions Élémentaires de Bacteriologie."

WE are pleased to announce that the valuable notes and memoranda of the veteran Norfolk geologist, the late Mr. John Gunn, will shortly be published, under the title of "Memorials of John Gunn." It cannot fail to be a deeply interesting book.

PART 10 of "The Canary Book," by R. L. Wallace, and part 10 of "British Cage Birds," by the same author, are to hand (London: L. Upcott Gill). Both parts are well up to their high mark.

WE have received number 106 of Wesley's "Natural History and Scientific Book Circular," containing 48 pp., all of which are devoted to works on Botany.

A WORK of much labour as well as of love is the Rev. E. N. Blomfield's brochure on "The Lepidoptera of Suffolk," published by W. Wesley & Son. It runs to 60 pp., and is a model of careful exactness, due to vast painstaking.

AT a meeting of the Institut de France (Académie des Sciences), Paris, held on December 29th, Dr. A. B. Griffiths, F.R.S.E., F.C.S. (an old contributor to SCIENCE-GOSSIP), was awarded an "honourable mention" in connection with the Prix Montyon which is given annually for researches in experimental physiology and physiological chemistry.

AN interesting addition has just been made to our British Pleistocene fauna by Doctor Leeson's discovery of a portion of the skull of the Saiga antelope (*Saiga tartarica*) in the Thames graves at Twickenham. Its remains had previously been found in the caverns of France and Belgium.

A NEW fossil wading bird has been found in the cretaceous rocks of Sweden, and named *Scaniornis Ludgreni.*

THE next International Congress of Geologists will assemble at Washington, U.S.A., on the 26th of August, after the meeting of the American Association for the Advancement of Science, which will be held the week before. It is expected that the committee will be able to obtain from the ocean steamship lines very favourable terms for foreign members. The secretaries are Messrs. H. S. Williams and S. F. Emmons, Washington.

MR. E. H. HANKIN, of St. John's College, Cambridge, is said to have discovered a cure for anthrax, to the study of which disease he has devoted himself many years. He based his investigations upon the principle of lymph inoculation, which Dr. Koch has so successfully applied in the case of tuberculosis. The glycerine extract in Mr. Hankin's process is precipitated with alcohol and re-dissolved in water. The experiment has been repeated on a number of subjects with gratifying success. This discovery derives additional interest from the fact that anthrax is not the only disease from which rats (the spleen of which animal produces the protective proteid) enjoy immunity.

A FRENCH chemist, according to the "Daily News" of February 11th, claims to have discovered the true process of photographing in correct colours.

WE are glad to see that the "Oological Expedition" to the Shetland Isles, projected in Birmingham, will not be allowed to take place. The question came up in Parliament on February 17th. Vandalism of this kind ought to have no mercy shown it.

We are sorry to record the death of an old contributor to our columns in Dr. H. B. Brady, F.R.S., &c., of Newcastle. Dr. Brady was distinguished for his large and specialistic knowledge of the Foraminifera, and Fossil and recent, on which he wrote several monographs, including the two superb quarto vols. on the Foraminifera of the "Challenger" expedition. He died at the comparatively early age of 55.

MICROSCOPY.

THE VERTICAL CAMERA.—Referring to a note I sent you about the use of the Vertical camera, I have received a letter from Messrs. Beck giving me full instructions. It only came to hand by last mail, and I see from it that the use of a slope is what they recommend. This I did not know when I wrote to you, and a notice in an old number of the "American Monthly Microscopical Journal" (on the distortion, apparently irremediable, incidental to one of the American forms of camera) rather served to mislead me. There is nothing new in the slope, and if you have not already consigned my note to the waste paper basket, pray do so.—*W. J. Simmons, Calcutta.*

THE QUEKETT MICROSCOPICAL CLUB.—The January number of the Journal of this well-known club contains the following papers:—"On the Vibratile Tags of Asplanchna," by C. Rousselet; "On the Stridulating Organs of *Cystocœlia Floridæ*," by R. T. Lewis; "On the Reproductive Organs of some of the Floridæ," by T. H. Buffham; "On Lacinularia, and a New Rotifer from Guildford," by G. Western; "On a New Diatom from the Estuary of the Thames," by W. H. Shrubsole; "Note on *Dinops longipes*," by C. Rousselet; "On the Human Spermatozoa," by E. M. Nelson, &c. The plates are numerous and good.

ZOOLOGY.

THE MIMICRY OF MANTIS.—An insect which is not uncommon in India is a medium-sized mantis, between three and four inches in total length. It is one of those mantises which have a long slender thorax, and which, owing to the second and third pairs of legs being very long, carry their thorax and head very high. In this insect the thorax is about half its entire length, and is of a bright grass-green colour without any markings, and it obviously mimics a grass stem. The abdomen is also somewhat slender, the wing-covers are of a grass-green colour, without markings, and it obviously mimics a grass blade. But in both these cases the mimicry is obvious, as also the reason for it, and it is not what I wish to call attention to. The first joint of the fore-legs is widened and flattened; it is also green, and the posterior surface is marked with a large ocellus. When the insect is undisturbed it remains generally in one place, but is not perfectly motionless; it sways perpetually and uniformly from side to side. In this position it looks very harmless, but if it is startled or alarmed its aspect instantly changes; it partly opens the wings, turns its head and thorax so as to face the terrifying object, makes a noise like a sudden, sharp puff of wind, very like the noise made by a startled snake, and raises its fore-legs so that the first joint lies along the thorax, and the inside margin of the expansion being nearly straight, it looks as if the fore-legs and thorax were connected. In this position the ocelli are very conspicuous, and with the small, triangular head, and the slender thorax, the effect is to produce a ludicrous resemblance to a diminutive cobra. Now, what puzzles me is this exact resemblance. The insect could not possibly be taken for a cobra on account of its small size and green colour; while if the object is only to appear formidable it could have been obtained without imitating a cobra so exactly. It may be suggested that there is no direct imitation, but that the same causes which have led to the development of the eye-spots in the cobra have also led to the development of ocelli in this insect, viz., that the apparent possession of a large head gives the animal more formidable appearance; but this explanation is apparently negatived by the pecular noise made by the insect, which certainly seems to indicate that a snake is imitated. Possibly the object of the noise is to suggest that it is some kind of snake, and then the ocelli may suggest that it is one of the cobra kind. May be, some of your readers may be able to suggest a better explanation. Anyhow, the thing is curious, and I think worthy of note.—*J. R. Holt.*

Hertfordshire Natural History Society.—We have received the May, July, September, and December parts of the Transactions of this well-known society, containing the Anniversary Address by the President Lord Clarendon, on "Field Sports and their bearing on National Character," and the following original papers—"Seeds and Fruits, their Structure and Migrations," by A. E. Gibbs, "Meteorological Observations," by John Hopkinson; "Record of Water Level in a Deep Chalk Well at the Grange, St. Albans," by H. G. Fordham; "Local Scientific Investigation in Connection with Committee of the British Association," by John Hopkinson; "Geological Photography in Hertfordshire," by John Hopkinson; "Some Hertfordshire Well Sections," by Wm. Whitaker; "Report on the Rainfall in Hertfordshire in 1889," by John Hopkinson; "Climatological Observations in Hertfordshire in 1889;" "Half-a-century Rainfall in Hertfordshire;" "Notes on Birds observed in Hertfordshire in 1889," by George Rooper, &c.

Influence of the Late Severe Winter on Small Birds.—The feathered tribes, especially the insectivorous species, suffered terribly during the inclement weather of December and January. Hedge accentors, tits, thrushes and blackbirds tried to keep life in their poor little famished bodies by coming round houses and disputing for stray crumbs with the sparrows. The want of food and water seemed to affect birds more even than the cold. In my outdoor aviary where the birds had abundance of food and water to drink, but little special protection against the cold, greenfinches seemed quite indifferent to the weather, but I had a few casualties among the other birds, especially the linnets. On the whole, however, they bore the severe cold very well indeed; a tame moor-hen I have in an out-door aviary seemed absolutely indifferent to it.—*Albert H. Waters, B.A., Cambridge.*

Lovers of Natural History are invited to join the Practical Naturalist's Society. Beginners may join as Associates. Prospectus for stamp from the Secretary, *Willoughby House, Mill Road, Cambridge.*

BOTANY.

Ornithopus ebracteatus.—Mr. Haydon, in his note about the Cyprus Spurge, which was published in your January number, mentioned that the *Ornithopus ebracteatus* was found at Folkestone by a visitor in 1888. As I was fortunate enough to discover it there in the same year, perhaps he would kindly let me know to whom he refers; amongst my own books I could find no reference to it, except as growing in the Scilly islands. I therefore sent it to the Secretary of the Natural History Society at Folkestone, but for this and other specimens I have sent him I have had no acknowledgment. I presumed it was not considered of sufficient value to be mentioned. In future I will record all my finds in your columns as Mr. Haydon suggests.—*G. Abbott, Tunbridge Wells.*

Plants Found in the Neighbourhood of Oxshott, Surrey, September 27th, 1890.—The following is a short general description of the district of Oxshott Heath, Surrey, and a list of plants observed there on the afternoon of September 27th, 1890, when the writer formed one of the members of a natural history excursion-party. The plants have all been recorded for the county, and so, scientifically, their present mention is of little value; but to those among whom this magazine circulates, who are little accustomed to moorland scenery, they may give some idea of flowers likely to occur in such districts. Oxshott Heath is about seventeen miles from the centre of London—I say centre because the metropolis is only too rapidly pushing out one of its arms in that direction, and the speculative builder is busy at work not many miles off. For so near London some of the plants are by no means of frequent occurrence, and the writer would urge upon collectors to gather their specimens with a sparing hand. Nearly all this district is in the Bagshot sand formation; and close to Oxshott railway station there is a curious sandy knoll or hill of considerable height; these sand-hills, many of them clad with Scotch fir, are quite a characteristic of this district. The St. George's Hills, near Weybridge, not many miles from Oxshott, are another good example. Although much of the Heath is elevated, covered with ling, furze, and clumps of fir-trees, there are peat-bogs abounding in sphagnum-moss, and in these most of the rarer plants are to be found. The plants noted were as follows:—*Ulex nanus*, Forst., very abundant on the sandy open parts; *Scabiosa succisa,* L., abundant; *Sonchus arvensis*, L., abundant; *Calluna vulgaris*, Salisb., in large masses, and still in full bloom; *Erica Tetralix*, L., fairly abundant in the moister parts; the flowers of some plants were very pale, almost white, in fact. *E. cinerea*, L., very frequent; *Drosera rotundifolia*, L., in fair quantity, growing amongst sphagnum-moss. *D. intermedia* is known also to occur, but none was noted on this occasion, and it is fortunate for its own sake that it is not easy to find in this locality. *Teucrium Scorodonia*, L., very common; *Mentha Pulegium*, this plant, which is rare elsewhere, was found in considerable quantity in the bog. *Scutellaria minor*, L., found very sparingly; *Verbena officinalis*, L., one patch found by roadside. *Narthecium ossifragum*, Huds. (Lancashire bog-asphodell), in large quantity in the bog, but only in seed. These plants were growing in a sheltered position; but on Sept. 3, 1890, I found plants of *N. ossifragum* on Ashdown Forest, Sussex, in an equally advanced condition, but these were growing in a bog in an open wind-swept gulley. Can any reader inform me whether an exposed situation causes such plants to flower and mature earlier than those growing more or less under the shade of trees? *Lastrea dilatata*; *Lomaria spicant* (immature), on banks; *Leucobrium glaucum*, in clumps, abundantly under the fir-trees. *Sphagnum squarosum*, *S. cymbifolium*, and *S. acutum*, in bogs. *Marchantia polymorpha*, abundant on the banks of ditches. In the case of identification of some of the plants my best thanks are due for help kindly given by some members of the excursion-party.—*Archibald Clarke.*

GEOLOGY, &c.

COAL SECTIONS.—What is the best and simplest method to make sections of coal, fossils, rocks, other than by the grinding process? Such as those made by Professor Williamson or Boyd Dawkins, of Manchester, and in the Museum (? The transparent). I do not know the acid or bleaching agent.—*V. A. Latham, F.R.M.S., F.G.S.*

BOULDERS IN THE MIDLANDS.—One of the best and cleanest finished bits of original work we have seen for some time is Mr. F. W. Martin's paper on "The Boulders of the Midland District" (a second report), reprinted from the "Proceedings of the Birmingham Philosophical Society." It is illustrated by a vigorously drawn map, showing the distribution of Midland boulders and the parent rocks from which they have travelled. Mr. Martin's paper is the most valuable contribution to local geology we have seen for some time.

THE GEOLOGY OF BARBADOES.—Very few nooks and corners of the globe are more geologically interesting than the West Indian Islands. Mr. J. B. Harrison, and Mr. A. J. Jukes-Browne have just issued a pamphlet on the subject published by the Barbadoes Legislature. The chapters relating to the Physical Geology of the Island are extremely interesting. The sections are instructive. Barbadoes is a typical "Oceanic Island," and is therefore worth double study. Messrs. Harrison and Jukes-Browne have here turned out good and well concentrated work.

THE CORAL ROCKS OF BARBADOES.—Messrs. Jukes-Brown and Professor Harrison recently read an interesting paper on this subject before the Geological Society. They first discussed the coral reef growing round Barbadoes, and described a submarine reef, the origin of which was considered. It was pointed out that there is no sign of any subsidence having taken place, but every sign of very recent elevation. They then described the raised reefs of the island, extending to a height of nearly 1100 feet above sea level in a series of terraces. The thickness of the coral rock in these is seldom above 200 feet, and the rock does not always consist of coal debris. At the base of the reefs there is generally a certain thickness of detrital rock in which perfect reef-corals never occur. The collections of fossils made by the authors have been examined by Messrs. E. A. Smith and J. W. Gregory. Of the corals, five out of ten species identified still live in the Caribbean Sea, and one is closely allied to a known species, whilst the other four are only known from Professor Duncan's descriptions of fossil Antiguan corals. The authors are of opinion that the whole of the terraces of Barbadoes, the so-called "marl" of Antigua, and the fossiliferous rocks of Barbuda are of Pleistocene age. The authors proceeded to notice the formations in other West Indian islands which appear to be raised reefs comparable with those of Barbadoes, and showed that these reefs occur through the whole length of the Antillean Chain, and indicate a recent elevation of at least 1300 feet, and in all probability of nearly 2000 feet. It appears improbable that each island was a region of separate uplift, and as a plateau of recent marine limestone also occurs in Yucatan, this carries the region of elevation into Central America, and it is reported that there are raised reefs in Colombia. The authors concluded that there has been contemporaneous elevation of the whole Andean Chain from Cape Horn to Tehuantepec and of the Antillean Chain from Cuba to Barbadoes. Before this there must have been free communication between the Atlantic and Pacific Oceans, which is confirmed by the large number of Pacific forms in the Caribbean Sea. Under such geographical conditions the great equatorial current would pass into the Pacific, and there would be no Gulf Stream in the North Atlantic.

THE GLACIAL PERIOD.—We have received a copy of Mr. Dugald Bell's paper, republished from the Transactions of the Glasgow Geological Society, on the "Phenomena of the Glacial Period," dealing especially with "the great submergence." It is one of the most exhaustive papers on the subject we have come across, and is well illustrated by maps, etc. This is Part ii. and we should be pleased if the author would send us Part i.

NOTES AND QUERIES.

RABBIT DYING OF OLD AGE.—In December a male rabbit, which has been in my possession from the age of three months, died, to all appearance of old age; he would have been ten years old in March next, the claws were considerably over an inch in length. A female of the same litter was so vicious, though always kindly treated, that it was necessary to take a thick stick when feeding her.—*W. A. Gain.*

Two Sides of the Medal.—Surely Mrs. Alice Bodington is labouring under some misapprehension as to what Mr. Wallace and other naturalists mean when they say that the effects of use and disuse are not inherited. I judge this to be so because as examples of the contrary she gives the cases of the inheritance of deafness, supernumerary toes, insanity and other characters which are born with people, not acquired by them either through use or disuse, and because her breath is taken away on reading Weismann's statement that "the inheritance of acquired characters has never been proved." Let us take the case of two men, A. and B. A. is born with large muscular limbs, while B. is not, but by dint of careful training and exercise he contrives to make his limbs as big as A.'s. Mr. Wallace, and those who think with him, say that A.'s children would be more likely to have muscular limbs than B.'s, since the big muscles of the latter are the result of use, while A's are natural. Again, suppose C. to be born without thumbs, and D. to lose his by accident. Does Mrs. Bodington suppose that D.'s children would be as likely to be born thumbless as C.'s? Wallace and Weismann think that D.'s children would be as likely to have thumbs as those of any one else. My friend Mr. W. P. Ball, in a little book recently published by Messrs. Macmillan, in "Nature Series," has analysed very destructively the cases which have been adduced in favour of the hypothesis of what he calls "use-inheritance," and I think that those who wish to look at both sides of the medal should read this work carefully.—*Charles Bird, Rochester.*

Two Sides of the Medal.—I think many of your readers would be glad if Mrs. Bodington would explain what third set of renals exist in vertebrates, besides the true kidneys and the Wolffian organs.—*F. R.*

Beche-de-Mer.—Will some reader of Science Gossip kindly inform me where "Trepang," or "Bèche-de-mer" can be procured in London—either by purchase or exchange?—*E. H. R., Painswick, Gloucestershire.*

NATURAL HISTORY NOTES.

On the 11th of August, 1887, a snow-white specimen of the yellow wagtail was observed on Quainton Hills (not far from this village) by a friend of mine. On the morning of the next day he saw it again, and got within a few yards of it, and saw it well before it flew away. Its flight and chirrup were quite normal. An albino wagtail I consider to be a rare and somewhat unusual occurrence amongst birds. Several white starlings have been observed in this neigbourhood at various times by different persons, and one was seen on the 16th of July, 1890, and again on the 18th with other starlings by my cousin, Mr. P. H. Ward, who also saw it settle on the back of a sheep, after it had flown from the place where he first saw it. Several white house-sparrows (more or less deficient in colour) have also been seen and shot in this district.

In the winter of 1885 a sparrow was caught in a trap with the crown of its head pure white, and one was seen on the 6th of last November, 1889, and again on the 18th, in company with a flock of its companions, with its back and tail quite white. So recently as September 24th, 1890, one with a white wing was observed amongst a large flock of sparrows, which frequented a stubble-field for the littered grains and loose ears of wheat when the rest had been carted away to the barn or stack. Another albino bird, of the finch family, was seen by my cousin on June 6th 1890, who thought it was either a chaffinch or a linnet, but he could not be certain of its species. I have been told by a person of good authority that he saw a white blackbird in his father's orchard a few years ago. Another parishioner said that when he was at harvest-work near Wendover, a few years ago, he killed a white pheasant.—*H. G. Ward, North Marston, Bucks.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

E. Pratt.—You may procure any of the following works relating to the botany, &c., of Surrey, of W. Wesley & Son, Essex Street, Strand: Brewer's "Flora of Surrey," with maps, price 7*s.* 6*d.*; "Flora of Reigate," by G. Luxford; Brewer's "List of Coleoptera, Lepidoptera, Fishes, Birds, &c.," price 2*s.* 6*d.*

A. Mayfield.—The average length of the slow worm (*Anguis fragilis*) is from 9 to 10 inches. Your specimen, 17½ inches long, is very unusual.

E. Parker.—*Re* "Lobster and whelk." It is not a lobster at all, but the hermit crab (*Pagurus Bernhardus*), which always lives in empty whelk shells, its own body being permanently soft. It is a type of a distinct order of crustacea.

B. C. Robinson.—You will doubtless obtain a good second-hand copy of Kirby and Spence's "Introduction to Entomology" of Messrs. W. Wesley & Son, Essex Street, Strand, or Mr. W. P. Collins, 157 Great Portland Street, London, W.

C. Oldham.—To preserve frogs, &c., try a mixture of half-and-half spirits and glycerine.

M. J. Teesdale.—You can prepare your new magic lantern slides by getting the usual sizes of *ground glass*, similar to those used for children's transparent drawing slates, and by placing them over any book illustration or otherwise, sketching on them with a pencil. The sketches can then be filled in with transparent oil colours.

R. de G. B.—You are probably correct in surmising that the cases are the cocoons of a coccus. It will be best to wait till they come out. The best Handbook on British Birds is written by Mr. Howard Saunders, and published by Messrs. Gurney and Jackson in twenty shilling parts, illustrated.

Miss Chichester.—The Editor is much obliged for the drawings and photographs of the holly bough, which is exceedingly interesting. The flattening is due to "fasciation," but it is uncommon in the holly.

EXCHANGES.

Wanted, choice unmounted material, polycistina, &c., in exchange for choice microscopic slides of every description.—R. Suter, 5 Highweek Road, Tottenham, London.

Wanted, fossils from various localities. Good duplicates offered in exchange.—Thos. W. Reader, 171 Hemingford Road, London, N.

Science-Gossip from vol. i. (1865) to vol. xvi. (1880), unbound, but wrapped and tied up in vols., with the exception of nineteen numbers, viz., June to December, 1876, and the whole of 1877. What offers for the lot?—T. Black, 190 Bellhagg Road, Sheffield.

WANTED, dried leaves of eleagnus, deutzia, onosmo, &c., also lepidoptera, Ulysses, morpho, rypheus, &c. Good exchange in micro-slides.—George Read, 87 Lordship Road, London, N.

TWENTY-TWO copper coins, and SCIENCE-GOSSIP from May to December, 1890, to exchange. What offers in fossils?—Walter C. Shield, 36 Garturk Street, Crosshill, Glasgow.

STUDENT'S microscope by Maw, Son, & Thompson; rack and fine adjustments, double nose-piece, two eye-pieces, ½ and ⅕ objectives. Want high-power objective, or first-class binocular.—Taylor, 26 Marchmont Street, London, W.C.

WANTED, eighth and following parts of Braithwaite's "Moss Flora," or "Sphagnaceæ." Dried plants and mosses, or other books in exchange, including Greene's "Cœlenterata" and "Protozoa;" Eyton's "Rarer British Birds" (woodcuts); Carpenter's "Microscope," and others. List sent.—J. A. Wheldon, 32 Langham Street, Ashton-under-Lyne.

OFFERED, "Our Earth and Its Story," 3 vols., and "Dictionary of English History," both in parts, but in excellent condition. Wanted a detective camera.—R. H. Lawton, 6 Mosley Street, Manchester.

WANTED, the "Library," vols. i. and ii. (unbound preferred), also "Great Thoughts," vols. i., ii. and iii., first edition. Both must be clean, complete, and in good condition.—Chas. Leigh, Library, Brit. Mus. (Nat. Hist.), Cromwell Road, London, S.W.

NUMEROUS duplicates in carboniferous fossils, especially ferns and corals, in exchange for trilobites.—P. Wright, Bruntwood, Galston, Ayrshire, N.B.

DUPLICATES.—Machaon, cardamines, agon, *Adippe Io*, polychloros, *P. chrysilis*, *Z. filipendulæ*, *E. lanestris*, *L. potatoria*, *Cucullia verbasci*, in exchange for others.—E. Wilson, 115 St. Martins at Oak, Norwich.

BRITISH reptiles and batrachians wanted, perfect adult living or spirit specimens, in exchange for correctly named foreign species or other objects.—G. E. M., 5 Warwick Place West, Belgravia, London.

GOOD specimens of dentaria bulbifera, and *Gentiana pneumonanthé*, in exchange for fossils from the Wealden London clay, and Bournemouth beds.—Curator, The Vicarage, Southborough.

OFFERED, good cast of ichthyosaurus from lias of Lyme Regis, 22 × 12. Wanted, any good fossils from any formation.—M., 56 Clarendon Villas, West Brighton.

WANTED, brilliant foreign coleoptera; need not be set, but must be correctly named. Good exchange given in first-class botanical sections, either mounted or unmounted, or objects of general interest. State quantity of specimens with sample.—R. G. Mason, 69 Clapham Park Road, Clapham, S.W.

MANY species of marine and land shells from S. Australia, Madeira, Porto Santo, and Gibraltar, for exchange. Any offer of shells—in good condition, and not already in collection—accepted. Send list of duplicates to—F. W., Lordship House, Tottenham.

WANTED, ether freezing microtome, Williams's preferred. Will give powerful Quackenbush air-gun, with slugs and darts, almost new, cost 48*s*.—H. Ebbage, Framlingham, Suffolk.

WANTED, good objective for microscope, ⅛ or $\frac{1}{10}$ inch, with Societies' screw; also "Micrographic Dictionary." Offered, three volumes of "Knowledge," and micro-slides.—P. Briggs, Clayton, near Bradford, Yorks.

DUPLICATES.—*Harpa ventricosa*, *Ovulum ovum*, *Cypræa arabica*, *Bulla ampulla*, *Olivancillaria gibbosa*. Wanted, other foreign shells.—J. E. Cooper, 93 Southwood Lane, Highgate, N.

WANTED, a copy of the "London Catalogue of British Mosses and Hepatics," published in 1881.—Ernest S. Salmon, Clevelands, Reigate.

I SHALL be very glad if persons interested in conchology, residing in Exeter and neighbourhood, and willing to cooperate in establishing a local society, will communicate with me. Address—L. J. S., Monmouth House, Monmouth Street, Topsham, S. Devon.

WANTED, any good poultry in exchange for minerals and geological specimens.—William Hetherington, Nenthead, Alston Moore, Cumberland.

COLLINS' ⅛, new, in fine condition, cost 3*l.* 3*s.* What offers in exchange?—E. Wagstaff, 3 Waterworks Road, Edgbaston, Birmingham.

WANTED, vols. 4–9 of the "Young Naturalist," bound or unbound; must be in good condition. State desiderata to—F. W. Paple, 62 Waterloo Street, Bolton.

SAVILLE Kent's "Infusoria," no further use for it, bound in half-green morocco cloth, excellent condition. What offers?—E. Wagstaff, Waterworks Road, Edgbaston, Birmingham.

FOR slide of starch grains from bulb of spider orchis, for the polariscope, send other slide.—John Boggust, Alton, Hants.

WANTED, fossils from all formations, in exchange for coal-measure fossils, *Spirorbis*, *Anthracosia robusta*, *A. acuta*, *A. elongata*, scales and teeth of megalichthys, rhizodus, &c. Address—John Laycock, 20 Botany Lane, Ashton-under-Lyne, Lancashire.

GOOD foreign shells wanted; need not be named. Offered, nat. hist. and other literature, or suitable exchange. Foreign correspondence solicited.—W. Jones, jun., 27 Mayton Street, Holloway, London, N.

WANTED, vars. of *Helix aspersa*, *H. nemoralis*, *H. arbustorum*, *H. hortensis*, *H. cantiana*, *H. pisana*, *H. virgata*, *H. caperata*, *H. ericetorum*, *H. rotundata*, *Bulimus acutus*, &c., *H. revelata*, type; *Clausilia Rolphii* and *biplicata*, *Achatina acicula*. Will give darts of helices in return.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

OFFERED, hardy fern roots, primrose roots, &c. Wanted in exchange, store boxes to hold insects, eggs, shells, fossils, coins, &c.—W. Z. Balmbra, The Cottages, Warkworth Station, *viâ* Lesbury, Northumberland.

ACHARIUS'S "Lichenographia Universalis," a fine, well-bound copy, offered in exchange for double nose-piece, bent, Society screw, or for good copy of Leighton's "Angiocarpous Lichens."—Wm. Smith, 28 Addison Place, Arbroath, N.B.

WANTED, Sach's "Text-Book of Botany," and parts of Braithwaite's "Moss Flora," also slides from mosses, ferns, and hepaticæ. Will give other mounts in exchange.—T. B., 124 Castle Street, Hinckley.

WANTED, to exchange "Knowledge," vols. i. to v., Carpenter's "Mental Physiology" "Nature," various volumes, and other books (list sent), for micro-slides, microscope apparatus, &c., or books on botany and microscopy.—G. Freeman, B.Sc., 51 Danby Street, Denmark Park, S.E.

SCOTCH lichens offered in exchange for southern species, especially from the English limestone districts.—Wm. Smith, 28 Addison Place, Arbroath, N.B.

OFFERED, *Helix pisana*, *rufescens*, *ericetorum*; *Planorbis complanatus* and *corneus*, *Bulimus acutus*, *Limnæa stagnalis*, *Clausilia rugosa*. Wanted, *Pisidium fontinale*, *Vertigo antivertigo*, *Zonites cellarius* and *nitidulus*, *Testacella haliotidea*, *Pupa secale*, *Dreissena polymorpha*.—H. W. D., Southborough Vicarage, Tunbridge Wells.

WILL give Flower's "Osteology of the Mammalia," for living pupa of lepidoptera, sphingidæ preferred.—Ernest Platt, West Street, Chipping Norton, Oxon.

OFFERED, *H. alborabris*, *H. throides*, *H. fallax* and *Z. excavatus* (North America), *Pecten tigrinus*, *Lacuna divaricata*, *L. pallidula*, *T. testudinalis*, *Myra truncata*, *Unio margaritifer*, *Cl. laminata*, *Pl. nitidus*, and many others. Wanted, land, freshwater and marine shells not in collection.—P. R. Shaw, 48 Bidston Road, Birkenhead.

WANTED, a good microscope, with accessories, in exchange for a safety bicycle fitted with trangent spokes, balls to all parts, patent tyres, and all latest improvements.—I. Russon, 15 Str. Collegio, St. Julian's, Malta.

OFFERED, foraminiferous material, mounted diatoms, or mounted pathological objects, in exchange for geological literature.—I. H. Cooke, Highland House, St. Julian's, Malta.

BOOKS, ETC., RECEIVED FOR NOTICE.

"An Explanation of the Phonopore," by C. Langdon-Davies (London: Kegan Paul).—"The Lepidoptera of Suffolk," by E. N. Bloomfield (London: W. Wesley).—"British Cage Birds," Part 10, and "The Canary Book," Part 10, by Robt. L. Wallace (London: L. Upcott Gill).—"Transactions Hertfordshire Nat. Hist. Society," Part 9, vol. v., and Parts 1, 2 and 3 of vol. vi.—"Phenomena of the Glacial Period," by Dugald Bell.—"The Honey Bee: Its Natural History, Anatomy, and Physiology," by T. W. Cowan (London: Houlston & Sons).—"Electricity; a Sketch for General Readers," by E. M. Caillard (London: John Murray).—"Are the Effects of Use and Disuse Inherited?" by W. Platt Ball (London: Macmillan).—"The Book of Aquaria," by Messrs. Bateman and Bennett (London: L. Upcott Gill).—"Geology of the Country around Liverpool," by Geo. H. Mortom (London: G. Phillip & Son).—"The Naturalist of Cumbrae," by the Rev. Thos. R. R. Stebbing (London: Kegan Paul).—"A Class-Book on Light," by R. E. Steel (London: Methuen & Co.).—Wesley's "Natural History and Book Circular."—"American Microscopical Journal."—"The Microscope."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Garner."—"Quekett Journal," January.—"Feuille des Jeunes Naturalistes."—"Quarterly Journal," Royal Microscopical Society, &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: M. J. T.—J. A. W.—E. H.—W. C. S.—C. O.—G. R.—D. W. B.—R. S.—T. W. R.—T. B.—A. H.—J. W. B.—T.—E. H. R.—S. B.—E. A. M.—F. H. W.—L. C. H.—W. M. W.—A. H. W.—W. P.—J. E. L.—R. H. L.—J. A.—E. H. W.—W. J.—F. W. P.—W. L. B.—E. P.—J. B.—J. L.—E. W.—W. H.—F. R.—B. C. R.—L. J. S.—J. E. C.—R. G. M.—E. S. S.—H. E.—P. B.—F. W.—F. C. M.—F. W. F.—C. B.—Miss C.—E. P.—W. J. S.—E. B.—T. B.—W. S.—E. W.—P. R. S.—G. F.—H. W. D.—G. A.—H. D.—W. G. K.—S. J.—T. G. B.—I. H. C.—J. S. N.—R. de G. B.—&c., &c.

THE COLOUR AND BANDING IN LAND AND FRESH-WATER SHELLS: A REPLY TO MR. FRYER.

By J. W. WILLIAMS.

SINCE forwarding for publication my reply to Mr. Pace's strictures on my article which was printed in the August number, Mr. Fryer has, on pp. 241 and 242 *ante*, published a very interesting and courteous criticism to which I may be allowed to reply. His opening remarks to a large extent I appreciate, but as shown by my concluding remarks of the article in question I gave the theory as a tentative one only, and certainly it will be conceded that no matter what our present knowledge may be, yet the promulgation of a theory on such grounds, and as a working one merely, is perfectly legitimate. There would be no harm done even if with further research it led to no good and stable result; for it certainly would not allow us to vegetate. With the qualification to Von Baer's law (italicised by Mr. Fryer), I do not agree, simply because it is a well-known fact and law that no matter whether retrogression has occurred or not in our present day forms, evolution has progressed primarily along a line leading from the simple to the complex. My critic says that if this is what I intend to "convey, it certainly does not accord with the views of evolution as laid down by Darwin, Wallace, and Spencer;" but this statement is plainly negatived by the fact that Mr. Wallace (*in litt.* September 7, 1890), agrees with my conclusions. Throughout Mr. Fryer does not seem to attack the main points in my theory, and our greatest difference seems to me to be this:—that he does not recognise the fundamental law of Hæckel, while I do.

This appears to me a pity, because while recognising to some degree Von Baer's law, he appears to totally set at naught the very law, on the principle of which the grandest contributions of embryology and palæontology have been furnished to the hypothesis of evolution, viz., that "Ontogeny is a brief epitome of phylogeny." And even more does it appear a pity since the majority of our biological teachers in this country give it as forming the groundwork, with that of Von Baer, on which the whole superstructure of the evolution hypothesis has been raised. In my reply to his several headings, I shall then count on the validity of these two laws, and I imagine legitimately in the present day teaching of science.

(1.) This sentence seems to me somewhat ambiguous, for to me Mr. Fryer appears to directly contradict himself in one breath. He uses the words "chitinous plug," and afterwards speaks of it as composed of "conchiolin, not chitin." I have replied to this criticism in my former note on Mr. Pace's strictures, and made reference to Balfour. I cannot see how it invalidates my theory if I believe in Hæckel's law.

(2 and 5.) The nuclei of my specimens of *H. virgata* are brownish horn-coloured, and not black. Possibly, there is a fallacy here; if a little of the digestive gland be left behind in cleaning, the nuclei may appear black. But even were it so, it would not negative the general conclusion to which I arrived, simply because it may but prove an after-extension or development of colour. That there is a law of extension of colour appears to me proved by the following sentence quoted from Eimer:—"Würtemberger finds that in Ammonites all structural changes

show themselves first on the last (the outer) whorl of the shell—as in living animals, *e.g.* in my lizards at the tail—and that then such a change in the following generations is pushed farther and farther towards the beginning of the spiral—as *e.g.* in my lizards towards the head—until it prevails in the greater number of the whorls" ("Organic Evolution," p. 31). This may explain the coloured nuclei of *H. maritima* and *H. syriaca*, but I cannot say anything of these as I have not any specimens of these species by me. And if there be such a law of after-colour extension, as suggested by Eimer, the reader will see that it has other bearings on my theory than the one here indicated.

(3.) Mr. Fryer, while recognising the fact that the Limnæas are horn-coloured, mentions the banded and spotted Chilinia, and the members of the families Paludinidæ, Neritidæ, Cerithiadæ, &c. With these exceptions other conditions I imagine come into play, but it is a patent fact that in all of them the young secondary shell is horn-coloured and unbanded. What these other conditions are is not known, but it is a pity that those exceptions which Mr. Fryer adduces are in the main foreign and cannot be observed by us in their natural and living state under their own peculiar environment or surrounding. Considering the fact italicised by me and remembering Hæckel's law, I cannot see how this criticism can invalidate my theory.

(4.) The fact that white "may be due to the molecular structure of the surface" rather, it appears to me, upholds and substantiates my theory. Mr. Fryer would not then allow a unicoloured white specimen any pigment secreting cells at all, that is on the grounds of theoretical reasoning; more of this deduction shortly. But if the primitive shell was horn-coloured, as he appears to admit, but that an advance to white was not next made, how does he explain the fact that the primary shells in the shell-gland are sometimes white, though more generally horn-coloured, and that the persistent primary shell in Arion, Amalia and Limax is always white? Remember in this connection the law of Hæckel, and do not forget it in re-reading the query which Mr. Fryer gives directly afterwards. But what does Mr. Fryer mean by atrophy of the pigment glands in this relation? Does he really mean that nature finds it easier to differentiate cells than to let them remain *in statu quo?* It appears to me, that considering the ontogeny of the shell was from horn-colour to white, pigment-secreting cells were only differentiated when pigment was needed, that during the horn and the white periods pigment cells were not in existence, and had never been developed.

(6.) I cannot see how the criticism affects my theory. If its "light appearance seems to be due to the absence of band-colour," etc., as most assuredly it does, or it would not be var. *exalbida*, then why may it not be a "reversion"?

(7.) Answered in my reply to Mr. Pace.

In his concluding remarks, Mr. Fryer leans towards the suggestion of Mr. Cockerell that the colour of our Hyalinæ is probably due to the suffusion of darker band colours. But if so, banded reversions would occur not only in one but in all the species, and this is known not to be the case. The question of *H. cantiana*, *H. cartusiana*, &c., as equally and more legitimately (I think) supports the opposite conclusion to that at which Mr. Fryer seems to arrive. I look upon banded specimens as more advanced in colour development than those which are unbanded. Banding means a specialisation of pigment-secreting cells in the mantle edge. And were Mr. Fryer's remark true, the bands in this case of Hyalina should be lighter than the ground-colour; but in the varieties he adduces, they are darker!

(i.) Answered by ontological facts, von Baer's law, and the law of Hæckel.

(ii.) This is more an extension of my theory than a contradiction. It shows that, in some cases, uncolourous specimens may be produced by an intermingling of bands, though ontology negatives this for horn-coloured and white specimens. Evidently castanea is an advance on the clearly banded forms of *H. nemoralis.*

(iii.) I cannot see how these observations, interesting in their way, affect my general theory. Again I stand behind the fortress of Von Baer and Hæckel, and to those who understand the full bent of the laws which were formulated by them it will appear that I shall not use much powder and shot.

(iv.) This also becomes intelligible in the light of the development of the shell. And I think more legitimately. What, again, I ask about the horn-coloured and whitish primary shells of the embryo, and the persistent ones in Arion, Amalia, and Limax?

(v.) Replied to in my answer to Mr. Pace. But *Helix aculeata* and *H. pygmea* are horn-coloured also! But besides what I have before said, what Mr. Fryer adduces as regards shrews and ants rests on probability and not actual observation. See the references which he gives.

"BIRDS OF THE WEST."

A FEW notes on birds observed by me, in the west of Co. Mayo, during the months of August and September, may be of interest to some of your readers. I saw no particularly uncommon ones: in fact, my observations merely comprise the results of a few desultory walks from time to time, most of my attention being occupied with fishing.

At the beginning of August, on the sandy sea coast, golden plovers were in some numbers and very tame: grey plovers did not seem to have arrived yet; dunlins also were exceedingly plentiful; they breed in the neighbourhood. Curlews and whimbrels were to be seen both by the sea, and especially inland, flying over the bogs, and arresting one's attention by their mournful cries: associated with them on the coast, were oyster-catchers, whose black and white plumage rendered them very conspicuous. All three birds are exceedingly wary and difficult to approach: in the open it is almost impossible to get within shot of them; the only chance of success is to hide behind banks and stalk them, often on hands and knees.

Whimbrels are called here "May-birds," as in many other parts of the kingdom, from the fact of them arriving in May: most of the natives consider them young curlews.

Knots and sanderlings were in large flocks: there were a good many redshanks, but I saw no godwits.

At high water, large flocks of ringed plovers were to be found on the sand, just above high-water mark: most of them appeared to be asleep in the sun; at any rate, they allowed me to approach within half-a-dozen yards before taking to flight; a few, however, in each flock were more restless, running about among their comrades in an aimless fashion.

On the marshes near the sea, one could always find herons (*hibernicè* cranes), on the look-out for crabs, I suppose; for crabs were the only animals I could find there. Later on, in the same place, I saw a good many snipe, and some small ducks. I could not get near enough to the latter to determine their species, but I think they were golden-eyes. I am told that the west coast of Mayo is a great resort of ducks and geese in winter: the people say that the geese are principally barnacles, but I think this is a mistake, as the name is very generally misapplied in Ireland to brent geese.

Hooded crows and rooks were very common: magpies, although very numerous and tame in most parts of Ireland, were conspicuous by their absence here: probably the want of trees in the district accounts for this.

I was surprised to see so few hawks: one or two kestrels, a single peregrine, and another that I took to be a sparrow-hawk—it was some distance off—were all I noticed. Report says, however, that there are a pair or two of golden eagles on the cliffs of Achill Island: I regret that I could not find time to go to look for them.

Inland, I saw a few common buntings; yellow hammers, linnets and meadow-pipits swarmed, but of goldfinches, tolerably plentiful in other seemingly similar parts of Ireland, I saw none.

On my pointing out a kingfisher to my gillie, he told me that he had never seen the bird before.

Water ousels were common on the mountain streams, and as I fished, flitted from rock to rock, and on settling bowed gravely to me in their comical way.

Wheatears were fairly numerous in September, there were very few swifts and swallows; terns were plentiful about some of the inland lakes, amongst them being a great many immature birds.

I saw a skylark with almost pure white body.

A good many rare birds have been recorded from time to time in Co. Mayo, but, of course, to get any, one must be constantly on the look-out, and collect systematically.

A barred warbler is recorded in a recent number of "The Zoologist" to have been procured near Belmullet in 1884, and to be now in the possession of Dr. Birkett of that town.

The natives have some curious beliefs: on asking one of the men who work the salmon nets whether he was not very liable to rheumatism from constant wading in the water, he informed me that at the beginning of the season, he ate salmon every day for a fortnight, and that in consequence, the water ran off his skin as from a duck's back. Another legend was, that all the rats which entered the precincts of a ruined abbey, used as a burial-ground, immediately dropped down dead. I took the trouble to visit the place, but saw no rats, dead or alive. On one of the graves were dozens of long "church-warden" pipes, it being the custom at a funeral for each of the mourners to deposit one on the tomb: do any of your readers know of a similar custom in any other part of the country, or the origin of the practice?

H. J. W.

THE CARBONIFEROUS LIMESTONE OF SCOTLAND.

By Chas. Wardingley.

[*Continued from p.* 64.]

TURNING now for a short time to the consideration of the carboniferous limestone as it occurs in the Dumfries district, it may be remarked at the outset that good exposures such as may be obtained in quarries and railway cuttings are rather limited in number. Of these, the best and most accessible are shown in the accompanying sketch-map.

The village of Closeburn is situated about twelve miles north of Dumfries, and the quarries are a mile to the south-east of the railway station. These have been worked almost continuously since 1770 and the vast amount of rock laid bare affords an excellent opportunity for its study. Here the limestone has blue-grey Silurian strata for its base or foundation, and the total depth or thickness, excluding the top rubble, is a little over 60 feet and is divided as under.

	Feet.
Permian shales and sandstone	8
Red magnesian limestone	12
Red sandstone and shales	20
Massive red limestones	20
Total	60

Over the red magnesian limestone are thin deposits or layers of shale of decidedly Permian age and yielding a few characteristic remains generally very much distorted. The upper seam of limestone is a magnesian rock, yielding on analysis about 40 per cent. of carbonate of magnesia and 55 per cent. of lime. The lower limestone on the contrary is of carboniferous origin and consists of thick blocks containing at least 90 per cent. of carbonate of lime, separated by thin layers of red shale. The general dip of the strata is to the N.E. at an angle of 10°. The interest attached to this exposure arises in a great measure from the mineralogical nature of the rocks which vary so much in colour and general appearance from those previously described. Indeed, but for the organic remains entombed we might almost imagine that by some means or other we had wandered into and were examining a Permian exposure in Durham, though the subordinate mammillary or botryoidal concretions so commonly and typically exhibited

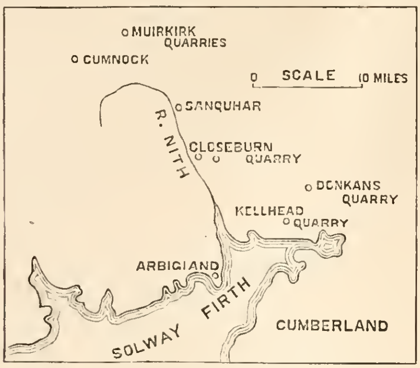

Fig. 52.—Map of Dumfries District, showing Limestone exposures.

there are entirely absent in the rocks under our notice. The fossils, however, soon show the true nature of the deposit and all doubt is quickly dissipated by the presence of *Productus giganteus* and *P. semireticulatus*. These characteristic fossils are very common and fairly perfect, but other species, *Zaphrentis*, *Euomphalus*, *Bellerophon*, and *Spirifera* are rare, badly preserved, and their identification is often a matter of considerable difficulty.

Better exposures are found further north at New Cumnock, near Muirkirk, in which locality the carboniferous limestone is very extensively quarried. The total depth of rock obtained here is 70 feet, while the colour is again of the red tint imparted to it by its proximity to magnesian strata. The fossil list is a fairly long one and the diligent student should have no difficulty in obtaining from the various quarries of the immediate neighbourhood satisfactory specimens of *Orthis resupinata*, *Productus semireticulatus*, *Rhynchonella pugnus*, *Spirifera bisulcata*, *S. glabra*, *Bellerophon urii*, *Poteriocrinus crassus* (parts), *Lithostrotion irregulare*, *Cyathophyllum turbinatum*, *Athyris roysii*, *A. ambigua*.

An excellent exposure occurs at Kellhead, a little to the north-east of Annan where there is an outcrop about 50 feet thick on the top of a hill or ridge overlooking the Solway Firth. This place is certainly worthy of a visit, not for the sake of its geological interest alone, but also for the commanding view of the surrounding district which can be obtained from it. Nor is it possible to find a better or more typical example of the true "Mountain Limestone" in respect of its physical aspect, and a day spent in and about this quarry and hill will do more to impress upon the mind the distinctive features of the formation than weeks of reading or class-room work. The red colour still prevails, but the rock in many parts is very friable, owing to the fact that it is chiefly made up of Encrinites, held together by a binding of clayey-looking lime. Want of space prevents us from describing at length the various remains found at Kellhead, and for the present we must only name those which occur most abundantly and perfect in this very interesting

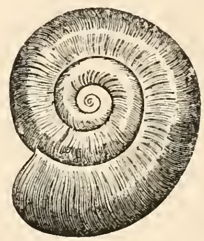

Fig. 53.—*Euomphalus pentangulatus.*

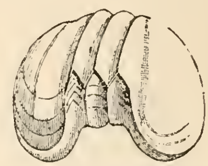

Fig. 54.—*Rhynchonella pleurodon.*

quarry. *Productus giganteus* are again numerous, and owing to the soft nature of the rock are not difficult to extract. *Euomphalus pentangulatus* appear very perfect and in diameters varying from 1½ inches to 3 inches, while *Bellerophon urii*, and *Nautilus dorsalis* are also frequently found indeed; the writer remembers seeing, nine years ago, a garden walk adjoining one of the workmen's houses almost paved with them. The siphuncled and chambered *Cephalopod*, *orthoceras* is present in two or three species ranging from 2½ inches to almost 5 feet in length.

Compared with the Carboniferous limestone of England, we cannot help being struck with the many points of contrast rather than of agreement which present themselves to our notice. In the Carboniferous limestone of Scotland the beds and quarries are by comparison poor in respect of depth or thickness, and this is the chief reason why so many of them have been and are being abandoned. Wherever the beds dip at an inconvenient angle, it is unremunerative to follow them into the earth. And with regard to organisms too, there is a remarkable paucity of species, while even such as are to be found are generally far behind their southern contemporaries in regard to symmetry of form and state of preservation.

CONCERNING MARIGOLDS.

IT is curious to notice the tendency of late years towards the planting of yellow or orange flowers in English gardens. A railway journey round any London suburb will illustrate this: the little back gardens in the dingier streets are often ablaze with sunflowers, and cottage gardens in purer air follow suit. The marigold, under one or other of its varieties, seems to be an especial favourite, and that not in our own country alone. Cross to France and you will find the common orange one figuring as a pot-herb, and its petals introduced under the name of "soucis" into your soup. In the Channel Isles the same use is made of it, and it is so nearly wild as to be seen growing in waste places or by roadsides, while children make wreaths of the flowers to adorn the "cheap tripper" as he rides in the "cars" round the island. It's a pity that such a flower should be so vulgarised.

But truth to tell, it has a certain tendency towards gaudiness, a sort of rollicking behaviour, arising from its rapid growth and sprawling habit (I speak of the common, juicy kinds), which causes one to banish it from one's choicest flower-beds, and to relegate it to the shrubbery or to the kitchen-garden. It has some tendency to become a weed, and is treated as such. But for getting rapidly a blaze of colour with plenty of luscious green to back it up, for covering square yards of unsightly soil or rubbish-heap, commend me to our friend marigold. It is sensitive to light, like many of its comrades in the great composite family, and ere the dew falls shuts its yellow eyes, as if it were a magnified, glorified daisy.

One variety which is now before me, seems to illustrate Mr. Grant Allen's theory of the development of colour, for its ray-florets—the outer circle—besides doubling or semi-sterilising themselves, have attained a broad stripe of yellowish white up each strap-shaped corolla, the original orange being relegated to a tiny margin up each side, producing in the whole flower-head the prettiest effect. An even more refined member of the genus is the little French marigold with its stiff, slender branching stem and delicate, strongly-scented, pinnate leaves. This kind seems to be aiming at a further stage in colouring, for it is striped with dark brown, which, I take it, is only red overlaid with orange. Sometimes the disc-florets of the common kinds take on this brown velvety tint, as if they were aping their big kinsfolk, the sunflowers.

Side by side with these tiny flowers gardeners have produced those huge, unwieldy, double marigolds, which send up a juicy stem—admirable pasture for slugs and snails—crowned with a solid mass of glaring orange or sickly yellow flowers; no shape, no beauty, that I can see, though I have known the flower-heads used effectively in harvest decorations. Still, they always remind me of the rosettes seen sometimes on horses' heads, or of the favours worn at elections.

The scent of the marigold is not at all unpleasant; it resides chiefly in the leaves and stalks; but the stickiness (doubtless a protection against undesirable insect visitors) of the common kinds makes the gathering of a posy a disagreeable operation. The juice has its virtues, for have we not in our pharmacopœia "Calendula," of healing virtue to wounds of the skin? Lastly, the name is a sweet reminder of the Blessed Woman to whom so many of our English flowers are dedicated, and in whose honour this sojourner bears its English name.

M. E. POPE.

NOTES ON NEW BOOKS.

AIDS IN PRACTICAL GEOLOGY, by Grenville A. J. Cole (London: Charles Griffin & Co.). This is a most valuable and very welcome book to geological students. The subject is treated on lines wholly different from those in any other manual, and the book is, therefore, very original. Indeed, it should really be considered rather in the light of a companion vol. to the higher class of geological text-books. A large space is devoted to the best and readiest methods of examining minerals, both with the wet and dry processes; how to examine rocks and rock-structures physically and chemically; whilst the concluding part is devoted to the examination and determination of fossils. There are twenty-eight chapters altogether, and one hundred and thirty-six illustrations, mostly of fossils. We cordially commend Professor Cole's book to all zealous students of geology.

The Geology of the Country around Liverpool, including the North of Flintshire, by G. H. Morton (London: Geo. Philip & Son). Twenty-eight years ago Mr. Morton wrote a small book on this subject, which was much welcomed by field-geologists, inasmuch as it was the result of personal observation and exploration. Moreover, the author was well known as an accurate, able, and painstaking geologist. Since that period other equally able geologists have explored the same area, and Mr. Morton has himself, of course, added considerably to the subject. The result is the publication of the present well-printed and neatly got up volume; it is modestly entitled a *Second Edition*, but it is in reality a larger and altogether differently got up book, illustrated by twenty plates and fifteen woodcuts of sections, &c. We congratulate Mr. Morton on the excellent work he has turned out.

The magnificently got up vols. of the United States Geological Survey are always welcome to English geologists, to whom they are presented with a generosity which is in striking contrast to the niggardliness with which the equally valuable memoirs of our own Geological Survey are sent out (or rather not sent out) for press notices. These American volumes are aided by the best of illustrations and maps. The paper is good and hotpressed; the type large, clear, and bold; so that it is a pleasure to turn over the pages.

The Ninth Annual Report of the U.S. Geol. Survey for 1887–88 is a large volume of over 700 pp., and contains lengthy papers, abundantly illustrated, on "The Earthquake at Charleston," by Carl McKinley; "The Geology of Cape Ann, Massachusetts," by N. S. Shaler; and on the "Formation of Travertine and Siliceous Sinter by the Vegetation of Hot Springs," by Walter H. Weed. We have also received a splendidly got up monograph of over 400 pp., crowded with maps and woodcuts, on "Lake Bonneville," by Jerome K. Gilbert. The annual vol., dealing with the "Mineral Products of the United States," is, for the year 1888, by David T. Day. It deals with the working of numerous natural productions, including, besides all the metals, coal, petroleum, natural gas, asphalte, ozokerite, fertilisers, salt, mineral paint, and almost every kind of material put to use, which the rocks of the earth's crust naturally contain. These vols. are highly useful. In addition to the vols. we have received "Bulletins," Nos. 58-66, each devoted to a special geological or paleontological subject.

An Explanation of the Phonopore, by G. Langdon-Davis (London: Kegan, Paul & Co.). This work is printed in double columns, French and English, and deals in a very clear manner with the details and structure of the phonopore. There are numerous illustrations.

Electricity; the Science of the Nineteenth Century, by E. M. Caillard (London: John Murray). We have previously noticed favourably a book by Miss Caillard on "The Invisible Power of Nature." In the present work she gives a clear, readable, and easily-understood outline of modern electricity, chiefly for the benefit of general readers. With such a book as this at their service, no intelligent person need be ignorant of the most important and pregnant of the physical sciences. It comprises four parts, each having a series of chapters, devoted respectively to "Static Electricity" (or Electricity at Rest), "Magnetism," "Current Electricity," and the "Practical Appliances of Electricity." There are numerous illustrations.

A Class Book on Light, by R. E. Steel (London: Methuen & Co.), with 123 illustrations. This is not only one of the best little treatises we have lately seen on "Light," but on the elementary principles of optics and optical instruments as well. The contents contain eleven chapters as follows:—"The Nature, Source, Intensity, and Velocity of Light," "Reflexion from Plane Surfaces," "Ditto from Curved Surfaces," "Single Refraction at Plane Surfaces," "Refraction at Curved Surface-Lenses," "Dispersion," "Optical Instruments," "The Eye," "Interference-Diffraction," "Double Refraction and Polarisation," and on "Interference of Polarized Light."

The Foundations of Geometry, by Edward T. Dixon (Cambridge: Deighton, Bell & Co.) This is practically a new system of geometry based more or less on psychological data. It is a work calculated to stimulate criticism, and the author boldly invites it.

The Naturalist of Cumbrae. Being the Life of David Robertson, by his friend, the Rev. Thomas R. R. Stebbing (London: Kegan Paul & Co.) It is not every man who has such a "Life" of himself as this written whilst he is still living. Dr. Smiles set the example of raising literary statues to living heroes. Nevertheless, this book is altogether a delightsome one, relating the early and brave struggles of a worthy man, who stuck to business with such perseverance that for years past he has been able to devote himself wholly to natural history pursuits. David Robertson is one of the most amiable and modest of men; a quiet, unassuming, but indefatigable worker, who will, we sincerely hope, live for many years to come. Our readers should not fail to procure this entertaining and instructive book.

The Book of Aquaria, by the Rev. Gregory C. Bateman, and Reginald A. R. Bennett (London: L. Upcott Gill). We have already noticed Mr. Bateman's book on Fresh-water Aquaria. It is here reproduced, with Mr. Bennett's treatise on Marine Aquaria added, so that the two make up a handy book of reference for all aquarium keepers.

Pasteur and Rabies, by T. M. Dolan (London: G. Bell & Sons). Dr. Dolan herein goes a "crusher" against Pasteur's experiments connected with hydrophobia, which he not only disbelieves but absolutely condemns. He heartily declaims against what he calls "Vaccinomania." Readers of Pasteur and other similar experimenters will here find all that can be strongly stated on the other side.

The Honey Bee: Its Natural History, Anatomy, and Physiology, by T. W. Cowan (London: Houlston & Son). The author is a well-known writer and authority on the subject which this prettily got up book deals with. The part devoted to the anatomy of the bee will interest all naturalists. There is an abundance of original illustrations; and although Mr. Cowan has found himself obliged to deal with the subject in a very concise manner, it is not the less clear and highly readable on that account. We are pleased to draw the special attention of all bee-keepers to this excellent little manual.

The Natural Food of Man, by Dr. Emmet Densmore (London: Pewtress & Co.), is a brief but clever statement of opinion against the use of bread, cereals, pulses, and all kinds of starch foods. We cordially recommend the book to all our vegetarian readers, many of whom will find new arguments therein.

THE SPARROW.

DOUBTLESS, many will say when they see the heading of this paper, surely enough has been said about this bird. What more can be wanted? Nevertheless, the fact is, that not half its true history has been written. It is not my intention to write anything like a history, but I wish to state the peculiarities in the bird I have met with during the past breeding season. Last season, and the four previous seasons, I was inquisitive enough to look into the domestic arrangements of these birds, and found that each season gave a different result.

The clutches of eggs of last season, 1890, were larger or longer than those of 1889. In that season I did not obtain a clutch of six eggs, but in the season just passed I obtained four clutches containing six eggs each, and five eggs very commonly formed the clutch. Taking the season all through, the clutches gave an average of four and a half eggs each, and the average of the broods was not quite three and a half young birds; this is the highest average I have met with. The discrepancy between the eggs and brood was not caused by the infertility of the eggs, for the eggs, as a whole, showed a very high percentage of fertility, but in many cases by incubation ceasing after the embryo was well formed, and also by some of the young birds dying in the nest. The former I found when examining a number of clutches in a very advanced state of incubation. The dead or dying young birds are as a rule carried out and dropped at a short distance from the nest. I saw an unusual number of these little outcasts last season, owing, I believe, to the great fertility of the eggs.

A curious feature exhibited itself in the eggs. In many of the clutches there was a small egg, not pygmean, but perfect; in previous seasons I have met with one or two like instances, but last season it was of frequent occurrence. In the sixty clutches I have preserved it is quite conspicuous. I also met with what I consider to be a very great curiosity, that being a genuine pygmean egg; it is about the size of a blue tit's egg, it weighed sixteen grains and contained a small quantity of albumen. It is the only specimen I have ever seen or heard of. It was in a nest with three others of the ordinary size, two being of a light colour, the third of a slaty-grey like the pygmy. In the July number of this Journal I see recorded, by Mr. Tracy, of Ipswich, that another sparrow's egg had been found marked at the smaller end. I have not been fortunate enough to obtain a specimen, neither did I see any trace of smaller end colouring amongst the four hundred sparrow's eggs I examined during the season. Nevertheless, the peculiarity showed itself in the eggs of several other birds. The eggs of 1890 and 1889 showed a greater percentage of fertility than those of the previous seasons, and comparing the clutches of the two seasons they are very much alike in colouring, but if the eggs of the past season had been of a lighter colour I should have considered my theory of fertility and colour running together to have fallen through; however, I have the eggs to corroborate my statement.

I fail to understand why these birds are so erratic in their nidification; they appear to have no fixed type of nest, like nearly all other birds, but the nest is made to suit the site selected for it. The nearest approach to a fixed type is when the nest is built in a tree or bush, then it is of a domed bulky structure with an entrance at the top. Then, again, they have no fixed type of egg: the eggs vary very much in size, shape and colour. I know of no bird belonging to its family which lays such a large egg in proportion to its size, some of them measuring nearly one inch in length. Many will measure ·98, but I have never found a perfect egg fully an inch long. They prefer the society of man more than any other bird, and although greatly persecuted and maligned they can hold their own against all comers.

I read with much regret the sentence passed upon them in this Journal by Mr. C. Parkinson. However, it is to be hoped that it will not be carried out.

The following figures give the average of the broods for the past five seasons.

1886	Young birds	$3\frac{1}{4}$
1887	,, ,,	$3\frac{1}{8}$
1888	,, ,,	$3\frac{1}{3}$
1889	,, ,,	3
1890	,, ,,	$3\frac{1}{2}$

Every one must know that it is almost impossible to get at exact figures, but the foregoing give the full average; however, I have not the slightest doubt if more exact figures could be obtained that the average of the broods for the past five years would not exceed three young birds.

Popular opinion—which is always wrong—is that the sparrows have large broods, but as my investigation has been going on several of my sceptical friends find that they have been labouring under a very false impression as to the number of young birds in each brood.

Having seen my little friends breaking up various kinds of beetles, I thought I would see what they had to say to some fine fat cockroaches, so I turned some on the lawn; they were very soon amongst them. Some of the birds appeared at first afraid to attack the largest of these black-looking insects, but only one escaped by reaching cover, and he would have shared the fate of his companions had not the birds been frightened away.

JOSEPH P. NUNN.

WE are sorry to notice the death of Mr. Wm. Davies, F.G.S., lately of the British Museum, to whom many old students of geology were indebted for assistance.

THE SQUARE-TAILED WORM.

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

President of the Wesley Scientific Society, Author of 'Flowers and Flower Lore.'

TO anyone except an enthusiastic lover of nature the idea of grubbing among the grass, stones, mud and rubbish in search of such unattractive creatures as worms must be perfectly monstrous, and we quite sympathize with those matter-of-fact folk who take the worm-hunter to be a candidate for the lunatic asylum. We do not exactly see, however, why it is worse to dig for worms for scientific than for piscatorial uses, and in all fairness the angler and the naturalist should be made to sail in the same boat in this respect; if indeed the knight of the rod, who merely sacrifices the poor worms for his own delectation is worthy a place beside the knight of the scalpel whose aim is to further the interests of scientific research and extend our knowledge of God and His works.

Among our native worms there is one with a square tail (*Allurus tetraedrus*, Eisen) whose story has never yet been fully told by any English author so far as I am aware. It has been somewhat fully studied on the Continent, and at least one English writer has given us details of its anatomy, but so far all has been of a technical, unpopular character. When I speak of Allurus as the square-tailed worm I wish it to be understood that the term must be used in a modified sense, as we have one or two other worms which sometimes present this peculiarity, but not in so marked a degree. It was on account of the peculiar

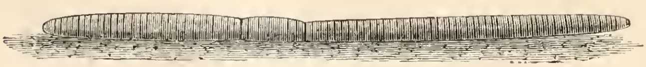

Fig. 55.—*Allurus.*

shape of the hinder half or posterior end that the worm, when separated from the old genus Lumbricus, because of the male pore being on the thirteenth segment, and made the type of a new genus, was named Allurus from the Greek words *allos*, another or different, and *oura*, tail. I shall endeavour to present what I have to say to the reader under three heads, in which the History, Description, and Distribution of the worm will be set forth.

I. THE HISTORY OF ALLURUS.

Allurus was apparently unknown to Linnæus, the father of modern science, who was very poorly informed in worm-lore. Savigny, who discarded the Linnean term Lumbricus, and adopted the Græcised word Enterion (from the Enteron of Aristotle), is the first author to give us any information respecting it. In Cuvier's *Histoire des progrès des sciences naturelles*, he calls the worm *Enterion tetraëdrum*, or the square-tailed worm. Dugès the same year gave an account of it in the *Annales des sciences naturelles* under the title of *Enterion Amphisbæna.* His reason for

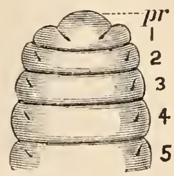

Fig. 56.—Anterior portion seen from above (dorsal): *pr*, pros

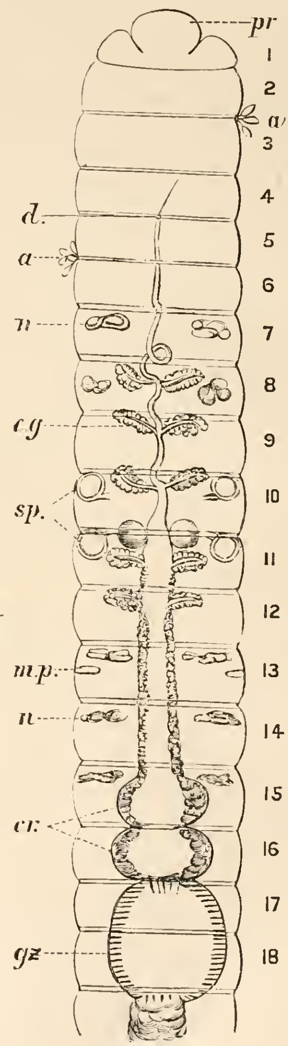

Fig. 57.—Allurus: segments 1–18. *a*, parasitic vorticella; *d*, dorsal pores; *cr*, crop; *cg*, calciferous gland; *pr*, prostomium; *gz*, gizzard; *mp*, male pore.

adopting the latter name is to be found in the fact that the worm can go as readily backwards as forwards, after the fashion of the serpent of which

Lucanus sang. Nine years later Dugès wrote again on worms in the same periodical, but put his worm by the side of Savigny's, and spoke of them as distinct species. He now calls them Lumbricus, and says of the first (*L. tetraëdrus*) that the clitellum is composed of seven segments ending with the 28th, and the worm is small and fragile, frequenting the neighbourhood of stagnant waters, and crawling out at night in their vicinity. Of his own species (*L. amphisbæna*) he says that there are six segments to the clitellum, which again ends on the 28th, and the habitat is the same. It differs, however, from the other not only in the number of segments which go to form the girdle or clitellum, but also in its smaller size, the prismatic and crenelated form of the tail, and the semi-lunar shape of the lip or prostomium, which in one case (*L. tetraedrus*) is only slightly angled on the side of the following segment, whereas the lip of the other species cuts the segment completely. The colour of the one (*L. tetraedrus*) is a dull brown, whereas it is violet in the other, and has a tendency to iridescence. These distinctions appear to have been overlooked to a large extent by later writers.

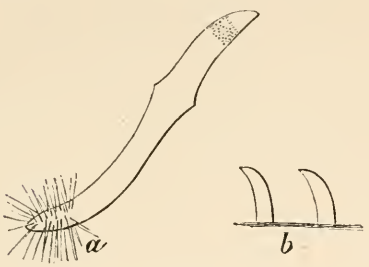

Fig. 58.—Seta (with five muscular attachments, *a*) and spinets.

In 1843 Hoffmeister gave the worm a new name (*L. agilis*), calling it the agile worm, which is very accurate, but not so characteristic as the names already given by Savigny and Dugès, as there are others quite as active. Though it still continued to attract attention, no alteration was made in the terminology till 1870, when Eisen first recognised it as a distinct genus, and called it Allurus, not merely on account of its shape, but because the male pore, or vulva as it was formerly called, is found on the thirteenth instead of on the fifteenth segment as in Lumbricus. Eisen has also recognised the existence of certain well-marked differences among the various specimens which he has examined, and he has named two or three varieties. I believe that in some instances specific rank will be ultimately accorded to some of the varieties, a point to be discussed in our next section. Since Eisen's day Allurus has been still further studied by Rosa, Beddard, and others, and I have been able from my own researches to confirm and amplify their accounts of this curious worm. The following table will present the historical data in a compact form, and enable the student readily to turn to the earlier monographs and works where the subject is discussed.

1828. *Enterion tetraedrum*, Savigny (Cuvier, "Histoire des Progrès des Sciences naturelles." Ser. ii., vol. iv., p. 17, or vol. ii. No. 20, p. 111).

1828. *Enterion Amphisbaena*, Dugès ("Annales des Sciences naturelles." Ser. i., vol. xv., p. 293, Plate 9, fig. 19, 20, 24).

1837. *Lumbricus tetraedrus*, and *Lumbricus amphisbaena*, Dugès ("Ann. des Sc. nat.," Ser. ii., vol. viii., pp. 17, 23).

1843. *Lumbricus agilis*, Hoffmeister (Wiegmann, "Archiv für Naturgeschichte," p. 191, tab. ix. fig. 6; "Familie der Regenwürmer," 1845, p. 36).

1870. *Allurus tetraëdrus*, Eisen ("Öfv. af Kongl. Vetensk. Akad. Förh.," p. 966; ibid. 1873, No. 8, p. 54).

Other references will be given under the next section.

II. DESCRIPTION OF ALLURUS.

It will be well, before I enter upon a detailed description of the square-tailed worm, to explain one or two of the technical terms in common use in this branch of science. The extreme anterior or fore-part of the worm's body is called the prostomium, because it is before and above the mouth (stoma). It is sometimes spoken of, less technically, as the lip. On either side of the body, usually about midway between the lip and the swollen portion, one finds either a protuberance or a depression. Here the male pore is situated, sometimes on papillæ, at other times sunk below the surface of the epidermis, and detected with difficulty. Its position and appearance, like the shape of the prostomium, is of great help in the identification of species. The swollen portion in an adult worm is called the clitellum, it is also popularly known as the girdle, while cingulum is the term in favour with some authors. Along the back there exist a number of minute apertures connected with the cœlom which are known as the dorsal pores, while there exist under or near the clitellum in certain species other pores called 'tubercula pubertatis.' Internally we find numerous glands and organs whose functions can only be understood by those who have read some account of the anatomy and physiology of the worm.

If we take the external characters first, we shall find that Allurus ranges from one to two inches in length, but is capable of stretching to nearly three inches when hastening away from its pursuer. It varies greatly in colour, as we have already seen, from a beautiful rich yellow to dull brown, and from a light brown to violet with iridescence. It has a square-tail, containing usually about forty segments, making the total number of segments for the whole body from seventy to eighty. I took an example the other day with sixty segments behind the clitellum. The clitellum often varies in colour from the rest of the body, which it sometimes appears to encircle entirely. It commences on the 22nd segment usually, and extends to the 27th, but the glandular cells of the clitellum extend to other segments as well. The male pore is on the 13th segment, and may be easily recognised, as it runs parallel with the segment-divisions, and is placed on either side of the body, somewhat on the under-surface, or ventrally. Beddard thinks the spermathecæ are on segment 8, which bears also rod-shaped setæ.* The dorsal pores commence between the 3rd and 4th or the 4th and 5th segments. The ordinary setæ are similar to those of our other native worms, but I have found minute processes on the extremity which projects outwards, similar to those described on some foreign species. The internal extremity is attached to its sac by fine muscular threads. They have a tendency to split up into 8 rows rather than appear in 4 pairs, and are about 2 centimetres long, or nearly half the width of the body. The *tubercula pubertatis* are said to occur on the 22nd, 23rd and 24th segments. I have so far failed to see them. For external characters, the following works may be consulted in addition to those already given. Grube, "Familien der Anneliden," 1851, p. 145; Oerley, "A Magyarors zági Oligochætåk Faunája," 1880, p. 598-601; Rosa, "I Lumbricidi del Piemonte," Torino, 1884, p. 51; Ude, "Zeitschrift für Wissen. Zool.," 1885, p. 139; Johnston, "Catalogue of British Worms," p. 61.

Owing to the small size attained by Allurus, it is somewhat difficult to dissect the worm in the ordinary way, so as to obtain perfectly reliable results, and it therefore becomes necessary to prepare sections by the microtome. My results differ slightly in some respects from those of Beddard.* He gives the gizzard one segment only (viz. the 17th), whereas in the worms I have examined the crop occupied 15 and 16, the gizzard 17 and 18. The nephridia seem to commence in segment 7. I have found 5 pairs of seminal reservoirs in segments 8–12 inclusive, being one pair more than Beddard reports. I find 2 pairs of spermathecæ, one in segment 8, and one in segment 9, and the calciferous glands, of which I find one pair, are in segment 10, just in front of the middle pair of seminal reservoirs. Here again I differ from Beddard; and the most reasonable explanation of this fact, I think, lies in the suggestion that we have been working on distinct species which have not yet been differentiated. In addition to what have been usually regarded as typical specimens, I have met with a totally distinct variety, which I formerly called flavus, but which I find has been named luteus by Eisen. It is of a beautiful, rich yellow colour, with orange clitellum, and a good deal smaller than the type. I found it plentifully by the Eden, near Carlisle, in 1890, and have taken one solitary specimen this year at Calverley, near Leeds. The following is a list of the species and varieties hitherto named by authors, which will probably shortly be amended and enlarged: 1. *Allurus tetraedrus* (Eisen); 2. *Allurus amphisbœna* (Dugès); 3. *Allurus*, var. *obscurus* (Eisen); 4. *Allurus*, var. *luteus* (Eisen).

For the anatomy one may consult Beddard in "Quart. Journ. Micr. Soc." 1888, Vol. vi., pt. ii., pp. 365–71, pl. xxv.; Rosa, "I Lumbricidi del Piemonte," p, 51 *seq.*; Ude, "Zeitschrift für Wiss. Zool." 1885, p. 139, &c.

* My further researches, since this paper was written, clearly point to the existence of at least two, if not more, distinct species.

III. DISTRIBUTION OF ALLURUS.

Eisen has described it from specimens found in Sweden and Beddard from a single worm sent from Teneriffe. Rosa has recorded it from North Italy; Oerley from Hungary, where also the varieties already named exist. Hoffmeister found it in North Germany, Dugès in France (probably about Montpellier), in which country more recent observers have also collected it, but Kulagin does not mention it in his recent enumeration of Russian species of earthworms. Oerley classes it as "Palaearktic."

It was first mentioned as British by Johnston in 1865, a single specimen being at that time in the British Museum. It was found in Devon, and I have found it in Yorkshire and Cumberland, together with the yellow variety. See Johnston's "Catalogue of British Worms," p. 61; Beddard, *op cit.* p. 365; and Oerley, "A Magyar. Oligochaetåk Faunája," 1880, p. 599 *et seq.*

LORD TENNYSON'S FLOWERS.

NOW that the thrushes have begun their morning and evening song, and the girls are offering the bunches of wild snowdrops for sale in the streets, our hearts begin to long for the spring flowers (never more prized than after this long and trying winter), and we begin to anticipate our coming pleasures by turning to the favourite passages that tell of our darlings. And who will bring the flowers of spring and summer before us as well as Lord Tennyson? Who else has distinguished, with suitable epithet, one wayside flower from another, and given to his exquisite landscapes the true finishing flower-touch? Other poets have sung in honour of flowers: Alfred Austin has celebrated the primrose in charming verse; Wordsworth has immortalised the lesser celandine; Burns has glorified the "bonnie gem"—the daisy—and thus re-echoed the praises of old Chaucer; but none has been at once so catholic in taste, so accurate in localisation, so exquisite in selection of epithet as the Laureate. This love of flowers is from the beginning; it is as evident in the earliest poems as in the latest; it is charming everywhere. In the early poems—published sixty years ago—we have the flowers in the old-fashioned Lincolnshire garden drooping under the action of the autumn frosts.

> Heavily hangs the broad sunflower,
> Over its grave i' the earth so chilly;
> Heavily hangs the hollyhock,
> Heavily hangs the tiger lily.

Perhaps the very garden in which, after his departure,

> Unwatched the garden bough shall sway,
> The tender blossom flutter down,
> Unloved that beech will gather brown,
> This maple burn itself away:
>
> Unloved the sunflower, shining fair,
> Ray round with flame her disk of seed,
> And many a rose-carnation feed
> With summer spice the humming air.

And around, or below, where the great Fenland swept away to the great sea:

> Far through the marish, green and still,
> The tangled watercourses slept,
> Shot over with purple, and green, and yellow,

and with

> The silvery marish flowers that throng
> The desolate pools and creeks among.

And with these we must quote, as characteristic of the scenery among which his earlier years were passed, "two of the most beautiful and melancholy lines in our language," as Henry Kingsley truly calls them:

> When from the dry, dark wold the summer airs blow cool,
> On the oat-grass, and the sword-grass, and the bulrush in the pool.

The meadow- and marsh-flowers are chiefly spoken of in the "May Queen":

> And by the meadow trenches blow the faint sweet cuckoo-flowers,
> And the wild marsh marigold shines like fire in swamps and hollows grey.

What a gleam of first May time those two lines bring with them! One can see the water-meadows of our Dorsetshire Stour, or of the Salisbury Avon, winding to and fro from Ringwood to Christchurch, where the wide moist meadows are on fire with marsh marigold.

In that lovely "Dirge," how he delights to bring together over the quiet grave, "the bramble-roses, faint and pale," "the gold-eyed king-cups fine," "the frail blue bells," "the rare broidry of the purple clover," till, as Shelley said, "making one in love with death to think one should be buried in so sweet a place."

Almost always the wild flowers are spoken of. In the spring "by ashen roots the violets blow," a line which once guided us to a lovely clump of white violets after a fruitless search elsewhere. Following Shakspere, he thinks how, when Arthur Hallam lies at rest in quiet Clevedon, "Of his ashes may be made the violet of his native land." So Shakspere, of Ophelia, "From her fair and unpolluted flesh may violets spring." But both our poets had been anticipated—

> Non e manibus illis,
> Non e tumulo, fortunataque favilla
> Nascuntur violae?

The orchis, "the foxglove spire with its dappled bells," "the little speedwell's darling blue," "deep tulips dashed with fiery dew," "laburnums, dropping wells of fire," each in turn recalling some pleasant spot, it may be in damp spring copse, or meadow, or by sunny bank, or in sloping garden. The glorious reaches of blue when the hyacinths carpet the ground are specially noted, for we read how Lancelot and Guinevere

> Rode under groves that looked a paradise
> Of blossom, over sheets of hyacinth
> That seemed the heavens upbreaking thro' the earth.

That is a bit of forest. We saw the very place last spring, quite close to Queen's Bower, near Brockenhurst, where, beneath stately beeches, the ground was covered with blue-bells, as we call them.

The mention of the delicate wind-flowers softens the rugged speech of the wild "Northern Farmer" as he tells how the keeper was shot dead, and lay on his face "down i' the woild enemies," a wonderfully pathetic touch, as it shows you the dead man with the delicate petals of the flowers whispering round the motionless head.

Do you want a broad summer landscape, with the scent of summer and the promise of autumn? Here it is:—

> When summer's hourly mellowing change
> May breathe with many roses sweet
> Upon the thousand waves of wheat
> That ripple round the lonely grange.

Can you not see the "waves of shadow pass over the wheat," and smell the fragrance of the wind that has travelled over the many roses? Surely some one has painted that "grey old grange" amid its far waving corn!

The simple happy cottage-flowers, "traveller's joy," "honeysuckle," rosy sea of gillyflowers, "close-set robe of jasmine," "lily-avenue," and so on, are noted, one by one, in a pretty passage in "Aylmer's Field," describing the houses of Sir Aylmer's tenantry.

But the most splendid use of the common flowers is in the finest of all his pieces on public events, the "Ode on the Death of the Duke of Wellington."

> Not once, or twice, in our rough island story,
> The path of duty was the way to glory:
> He that walks it, only thirsting
> For the right, and learns to deaden
> Love of self, before his journey closes,
> *He shall find the stubborn thistle bursting*
> *Into glossy purples, which outredden*
> *All voluptuous garden roses.*

The thistle referred to is the lovely purple-headed one that grows on the down-sides, with a more silvery leaf and a far more "glossy purple" than the common roadside sort. The use of this as an emblem of the unexpected reward of duty honestly performed, is one of the most telling selections in English poetry.

The way in which the commonest flower depends for its existence on laws the most profound and far-reaching is brought before us by the last quotation we must make.

> Flower in the crannied wall,
> I pluck you out of the crannies:
> Hold you here, root and all, in my hand,
> Little flower; but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.

W. K. Gill.

Eversley, Poole.

ROSSENDALE RHIZOPODS.

No. 2.

As promised in my last communication, which was introductory to the series, I now have to describe several forms of the naked lobose Protoplasts which have come under my own observation. First and foremost of these is the well-known and often-described *Amœba proteus.* This animal is familiar enough to the merest microscopical tyro, as it is found in the sediment of almost every pond and ditch. It presents itself under the 'magic tube,' as a shapeless mass of jelly; round the outer edge is a clear portion, the ectosarc, free from granules; while the interior endosarc is apparently more fluid, and contains a variable quantity of granules and food particles in different stages of digestion. If carefully watched, it will be seen to push out, at one or more points, rounded lobes of the clear ectosarc, as if, to use a simile of Professor Leidy, it had exuded or sweated numerous drops of liquid. These "lobes quickly elongate and assume the forms of digitate pseudopods," and as they lengthen the more fluid endosarc flows in. While these new processes are being pushed out, others are being retracted, and these Protean-like changes of form go on in such a way as to result in a slow, onward movement of the animal. The smaller forms have generally little colour, and these are of most frequent occurrence in this district. Others, however, found in waters having much organic matter in a state of decay, or where Algous food is plentiful, have considerable colour. This is found to be due to a variety of materials, which if carefully examined, resolve themselves into the following elements. Fine and coarse granules; rounded bodies of the nature of starch granules; yellow and brown oil-like drops; coloured water-drops; sand-grains; minute crystals; yellow, brown or green food-balls, often surrounded by a clear space filled with liquid; and more recently ingested food, such as Desmids, Diatoms, Zoospores, fragments of Oscillatoria and other Algæ. In addition there are generally a discoid somewhat granular Nucleus, and near it, the contracting vesicle, or pulsating organ, often of a delicate pink hue. Amœba can take food at any part of its surface, and the discharge of effete matter is likewise ejected from any part, but according to several authorities, more frequently from that which at the moment happens to be posterior. On coming in contact with suitable food material, Amœba puts forth a portion of the clear ectosarc, and surrounds the object, which subsequently appears to sink into the endosarc, becoming enclosed in a vacuole, in which by a process of digestion it becomes indistinguishable from other food-balls, previously ingested. They vary greatly in size, from $\frac{1}{50}$ or larger to $\frac{1}{500}$ of an inch. There are many points in the economy of Amœba which I must pass over, owing to limitations of space; sufficient has been written, however, to enable us to judge of the correctness of some remarks of Professor Carpenter, in his "Introduction to the Study of the Foraminifera." He says, "A little particle, of apparently homogeneous jelly,

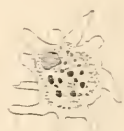

Fig. 59.—*P. lobosa.*

Fig. 60.—*P. lobosa.*

Fig. 61.—*P. lobosa.*

Fig. 62.—*A. villosa.*

changing itself into a greater variety of form than the fabled Proteus, laying hold of its food without members, swallowing it without a mouth, digesting it without a stomach, appropriating its nutritious material without muscles, feeling (if it has any power to do so) without nerves, propagating itself without genital apparatus, and not only this, but in many instances forming shelly coverings of a symmetry and complexity not surpassed by those of any testaceous animals." Fig. 59 shows a very common form here, from clear ponds; it is small, with the pseudopodia somewhat radiately arranged, and shows the Cont. vesicle. Fig. 60 a larger form, also common, with Diatoms, &c., recently ingested, no

Nucleus, or Cont. vesicle visible. Fig. 61, a form with rather conical pseudopods, sarcode stretched over a long Diatom. The Rhizopods of this genus, possessing no definate or constant figure, species mongers have taken full advantage of their opportunities, and have given specific names to a number of slightly different forms. There are, however, a few, which exhibit permanent differences, which in the present state of our knowledge, it may be as well to distinguish in this way.

Amœba villosa, which is locally uncommon, differs from the preceding in several particulars; it has a distinct anterior and posterior region; the villous part, which is knob-like, is always posterior, and is covered with persistent, prickle-like pseudopodia: the anterior part is broadish: ectosarc, a well-defined zone, and its general form is irregularly clavate, occasionally with two or three broad, anterior lobes. There is a single, generally large Cont. vesicle posteriorly situated, and a little in front of this the Nucleus. Size from $\frac{1}{50}$ to $\frac{1}{150}$ of an inch. Found among mosses, Algæ, and frequently in Sphagnum. Fig. 62, small form with Cont. vesicle. Fig. 63, larger form with three anterior lobes, Nucleus, and two or three Cont. vesicles.

Amœba radiosa is another small and inactive species, very rare here. Indeed, so rare is it, that I have never found it in any of the numerous places where I habitually collect. My first and only specimens were taken from a plate which had been under a Fern-case. There were literally thousands of them, among the floccose sediment, along with other obscure Rhizopods (Vampyrella, &c.) and *Rotifera vulgaris* and *Philodyna erythothalma*. They have from two or three to a dozen tapering pseudopods, and these may be short or two or three times the diameter of the body. This form has little colour, and I never found any with food-balls or coloured drops of any kind. There is generally a distinct Nucleus, and one or several Cont. vesicles. It is when freely floating that they exhibit their characteristic radiate form; when crawling this is somewhat lost, as the pseudopodia are either retracted, or a few only are put forth in the direction of motion. When calmly floating the pseudopodia may be seen shortening or lengthening, or slowly bending back-

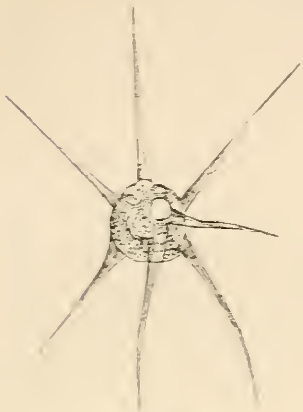

Fig. 63.—*A. radiosa.*

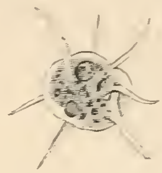

Fig. 64.—*A. radiosa.*

Fig. 66.—*A. villosa.*

Fig. 65.—*A. radiosa.*

Fig. 67.—*A. verrucosa.*

Fig. 68.—*A. verrucosa.*

Fig. 69.—*Pelomyxa villosa* beginning to put forth its pseudopodia.

Fig. 70.—*Pelomyxa villosa* in motion.

wards and forwards. Size about $\frac{1}{200}$ of an inch. Fig. 64, an ordinary form showing Nucleus and Cont. vesicle. Fig. 65, small form, which withdrew all the pseudopodia except one; this although constantly moving, lengthening or shortening, remained persistent for over an hour during which it was under observation (Fig. 66). Another specimen with longer pseudopodia.

The next form, *Amœba verrucosa*, is the last of the naked lobose Rhizopods I have found in this district. The illustrations (Figs. 67, 68) give a fair idea of young specimens; older ones are a little larger and generally contain more Algous food, though not in such quantity as to destroy their translucency. It is said to be very common, but I have very rarely found it, and unfortunately I have omitted to note the exact locality. It is, I think, a good species. Ordinarily it presents a quadrately rounded form, with broad expansions of the ectosarc, which in this species is unusually distinct. Old specimens are very sluggish, but younger ones are active, and when moving across the field of the microscope, the broad end is always in front, so that there is a distinct anterior and posterior part. The Cont. vesicle is large and posterior; Nucleus generally obvious, a little in front of the Cont. vesicle. The creature does not put forth distinct pseudopods, but the ectosarc rolls forwards as a short, broad lobe and the endosarc gradually follows so as to maintain the same relative position. The creasing of the ectosarc, appearing as fine, more or less permanent lines, reaching from the back forward as far as the endosarc, is very characteristic, and will greatly assist the student in identifying the species. Fig. 67. Specimen with large Cont. vesicle and single Nucleus. Fig. 68, another with Cont. vesicle partially contracted, food-particles present; these generally consist of Oscillatorian fragments. In the naked lobose Rhizopods there are four Genera and about eight Species. Amœba, as described. Pelomyxa, slug-like, with wave-like expansions of the ectosarc; Dinamœba, whose pseudopods are long, conical, sometimes furcate; with surface of body and pseudopods covered with spicules of motionless cilia; and Ouramœba, with fixed filamentous appendages. These all belong to the sub-Order Lobosa, and are of great interest, but as I have not yet found them, winter having effectually put a stop to collecting, I omit all further reference to them here. In my next paper I shall commence the description of the testaceous forms, illustrating the chief varieties of the various species found in Rossendale.

P.S.—*Pelomyxa villosa* is another of the naked Rhizopods, which, while absent from many ponds, is yet numerous in others. It is closely allied to *Amœba villosa*, if indeed it is not a state or condition of that Rhizopod. It differs from it chiefly in having numerous Nuclei and Cont. vesicles scattered through the body mass. It is one of the very largest forms, and its endosarc is crowded with dark granules, a considerable quantity of quartz sand; and, being a voracious feeder, Desmids, Diatoms, and other Algæ. When at rest it is of sub-globular form, but frequently buds forth small lobes of its clearer ectosarc, as a preliminary to activity (see Fig. 69). The somewhat globular villous patch, which is always posterior, has a prehensile function. Nuclei small and numerous. The same description is said to apply to the contracting vesicles, but in the specimen from which the drawing was made there was most certainly one very conspicuous Cont. vesicle. Colour, very variable, but by transmitted light, usually a dark grey or brown, in some cases approaching to black.

J. E. Lord.

Rawtenstall.

OUR LANE.

A LANE, an English country lane! To the dweller in a city's murky streets what more suggestive of peace and beauty? In the very word there is a ring of rusticity; it tells us that it is not a high- but a bye-way, one off the beaten track—one more secluded, peaceful, fragrant. The thought of it calls up visions of mossy banks and o'erarching trees, sweet-smelling hawthorn hedges with eglantine and bryony festooned, and gay with roses white, with crimson tipped. Nor does the pleasant vision exist only in the imagination of the poetic dreamer. Nay, thank heaven! in this our lovely native land there still are left to us a thousand country lanes, as rich in beauty as they were in ages long since passed.

'Tis not, however, of lanes in general that I would now discourse, but of one particular lane—that special, secluded, restful spot of earth on which it is our hap to dwell, and which we love to designate *par excellence* "Our Lane."

In this our sin and sorrow stricken world 'twere hard to find a spot so sacred to peace that no disturbing element will e'er be found within its precincts, and, mayhap, the occasional inroad of merry school-children, full of boisterous mirth, or lumbering wain, somewhat harshly jingles upon the ear of the recluse, but such infrequent breaks but serve to enhance the restful atmosphere which here prevails; nor do I begrudge the young ones their season of innocent enjoyment; to many of them it may be only far too brief.

Our lane is situated in a lovely, richly-wooded, old-world western county, whose benighted inhabitants slowly yield to changes of so-called modern progress, and as slowly help to swell the calendar of crime. Beautiful for situation is it—in every season charming. But 'tis in early summer—say in leafy June—when from the thicket the mellow-throated blackbird mingles his fluty notes with the bright outpourings of the sweet-voiced thrush—when 'tis brimful of birdsong, rustle of leafy shade, and hum of happy insect life, that its beauty most commends itself; for then, methinks, 'tis at its very best.

Its sinuous course extends through rich pastures and mossy orchards, from the brook at the bottom of our lovely valley, right away up and up, until it widens out upon the breezy height some 900 feet or more above the sea level. No unsheltered half-mile course is this, for its steep banks are high, surmounted with luxuriant hedges, and with lofty trees o'er-arched, and even when "November chill blaws loud wi' angry blast," the wanderer here may bid defiance to the tempest. His upward glances may discover the bowing and swaying of the tree-tops before the forceful blast, which onward sweeps the ruddy shower, and carpets the ground beneath with glossy beech leaves; but, through it all, as undisturbed his steps as separate his lot from the tumult and harass of the outside world. Now and again, sweet glimpses of the lofty hills and overhanging woods afford him a foretaste of the treat in store when he reaches the topmost height, for his footsteps lead him ever upward, until he emerges from the shade into the breezy open, when what a glorious prospect meets his eye! Hills beyond hills, all richly clothed with beech, and larch, and pine. Here from this lofty ridge his eye embraces two lovely valleys—*this*, "the Switzerland of England," the most sequestered and richly-wooded of the two; the most steep and narrow; and from wood to wood and hill to hill the eye may rove, until hill, and wood, and cloud, all harmoniously blend in a mellow hazy distance. *That*, more open and wide-spreading, its bounding hills more sweeping in their contour, but yielding as fair a scene, and behind that swelling down descends the westering sun; and whilst the steep valley slopes are sleeping in deep shadow, the fleecy cloudlets glow in his rays, and give fair promise of a bright to-morrow. Across the valley there is Painswick Hill—nearly the highest point in the county—and from it we see on the one hand the Vale of Glo'ster, the Severn, and far beyond—on the other, the hills and woods—the towns of Gloucester and Cheltenham; and out there, in the purple distance, the lofty Malvern Hills. Such scenes as these mark epochs in one's life.

Here then, far removed from earth's hurly-burly, rest awhile, inhale the breeze, fragrant with floral odours innumerable, and rich with refreshment alike to the jaded spirit and the weary body. No situation more conducive to restful feelings than the summit of some lofty eminence, some mountain peak, some mighty swelling hill like this. Here on some turfy couch reclining, at this high altitude one feels so far removed from life's sore turmoil, the city's roar, the strife of contending factions; and soaring heavenward, one strives to rise superior to the grovelling things of earth. And yet, withal, how oft the humbling thought obtrudes—How very, very small am I; yea, but an atom in an Universe.

Cast the eye whithersoever one will it lights upon woods. There lies the largest of them all, said to be one of the most extensive in the kingdom; and there, where those advancing wooded slopes, which, from opposite sides of the ravine upward climb towards the sky, consecrated to peace and beauty, is my favourite resort.

Adown the steep hillside the pathway leads, until we reach "the bottom." Here, sheltered in the bosom of this lovely valley the outer world and I are quit, and "every sense is joy." No storms—no chilling blasts invade these bosky depths profound; nor sight nor sound of higher animal life disturb the stillness, save when the agile squirrel leaps from branch to branch, or timid rabbit scampers across the path, or jay's or magpie's discordant notes are heard.

Yet let it not be thought that these solitudes are untenanted, for a myriad host of insect atoms hum, and flit, and flutter out their happy day in the genial sun-rays of this insect paradise. Butterflies innumerable disport themselves, and a long chain of wood ants' nests skirt the sunny edge of the gloomy larch wood. This exuberance of insect life betokens an equally redundant flora; indeed, in all my wanderings never before was it my hap to light upon such a wealth of floral beauty, nor from the appearance of the first flower until the last withering leaf has been swept from the bare woods fails there a display of Nature's most beautiful productions. I have sometimes thought that not a flower that blooms but here finds its representative—methinks a harmless fancy, and one that I delight in.

Deep fringed with moisture-loving plants there, too, meanders through this deep ravine a brooklet, and oft do I cast myself upon its mossy bank to contemplate the marvellous perfection of Nature's handiwork. Call me not a visionary if I evoke bright fantasies out of the sweet music of whispering winds—the odours of thousand flowerets, and flutterings of scaly wings in golden sunbeams. Not idly do I spend my hour, for sadness I beguile, and homeward turn my steps, mentally and physically refreshed.

The picture has another side. Not always is the silence thus unbroken—nor ever is the solitude replete with gentle sounds, for when summer's bright-hued floral pageant has vanished, the song of wild bird is hushed, and the year, no longer young, has yielded to the decrepitude of age, then the howling tempest rages and threatens, and the lofty tree-tops, responding to the sweep of the wind, pour out such wild music as thrills the listener beneath, and transports him in imagination to the lonely sea-shore where roaring billows toss and heave. Delightful transition! 'tis Nature in her varying mood, and her wild harmonies how sweet.

Presage of blissful repose, comes the blessed evening's fragrant breath, fitting termination this quiet spot to a delightsome stroll. Here, then, wanderer, rest, and whilst you gather "the harvest of a quiet eye," let me discourse awhile anent the denizens of "Our Lane."

And first to merit mention assuredly are those ministers to our happiness, our little feathered friends. They abound in our lane, and notably within the precincts of our garden and orchard, for here in my berried shrubs, and ivy and other climber clothed walls, they find food, shelter and protective care; here, unmolested, they build their curious nests, and raise their young broods—'tis to them a veritable bird paradise.

My list mayhap embraces no great rarity, but includes—not excepting the nightingale—nearly all most noted for their sweet song. Foremost let me mention my sweet-voiced friend the common thrush (*Turdus musicus*) who much affects my garden. Could I ever tire of his melodious outpourings? I trow not; nor do I tremble for my fruit when I see his lovely speckled breast beneath my shrubs, for well I know that soon his tap-tap-tap upon his favourite stone is the death-knell of the marauding snail. Fearlessly, last summer, a pair built their nest beneath the thatch of my summer-house, and but five and a half feet from the ground, and although I made a daily visit to the spot, and at but a foot distant would stand and watch the sitting mother—not once she fled her home, but, fixing her trustful eyes on mine, calmly sat on.

Their near relation, too, the missel thrush (*T. viscivorus*) is a frequent visitor, and until the last berry of the mountain ash has been gathered frequents our lane. Somewhat less welcome to me is the jetty plumaged blackbird (*T. merula*), for much as I delight in the flute-like notes of this mellow-throated songster, he lays my fruit under such heavy contribution that, sometimes, methinks, I dearly pay for his sweet music. Abundant though he is in all the bends and twists of our lane, he most affects our garden—as does that shyest of birds, and sweetest singer of the feathered choir, the blackcap (*Curruca atricapilla*). From the time of his arrival, about the first week in April, until he takes his departure, about the end of September, he much affects my shrubs, and pours out his most tuneful notes from morn till eve. Sweet, affectionate bird; a thousand times welcome to the fruit you claim as the guerdon of your delightsome song.

(*To be continued.*)

SCIENCE-GOSSIP.

The Second Loan Exhibition of the Woolwich District Natural History Society (President, the Rev. J. W. Horsley), held at the Freemasons' Hall, Mount Pleasant, was very successful. The exhibits were of a high order, and represented most branches of natural history. The collections of fossils, shells, star-fish, crustacea, coleoptera, lepidoptera, and botanical specimens were very good, and contained many rare species. There was also a large assortment of African weapons, implements, spoils of the chase, and many other curiosities too numerous to mention. Throughout the evening various electrical appliances and a number of microscopes were exhibited.

The Easter Excursion of the Geologists' Association will be to the Isle of Wight, under the direction of Professor J. F. Blake and Mr. Thomas Leighton.

A new quarterly magazine has been started at Leeds, under the title of "The Conchologist." It is edited by Mr. W. E. Collinge.

The Annual Exhibition of the South London Entomological and Natural History Society will be held at the Bridge House Hotel, London Bridge, S.E., on Wednesday and Thursday, the 15th and 16th of April next. On Wednesday it will be open from 7 until 10.30 P.M.; Thursday from 1 to 6 and 7 till 10 P.M. Particulars and tickets can be obtained of the Hon. Sec., Mr. H. W. Barker, 83 Brayard's Road, Peckham, S.E.

We are glad to inform our readers that the proposed oological expedition to the Shetland Islands has very properly been abandoned.

We have received a copy of the interesting "Monthly Circular and Journal of Proceedings" of the Huddersfield Naturalists' Society.

We have also received a copy of the useful "List of Microscopical Preparations" from Mr. J. Sinel, Jersey.

At the Annual Meeting of the Geological Society, the Wollaston Medal was presented to Professor Judd; the Murchison Medal to Professor Brögger, of Christiania; the Lyell Medal to Professor McKenny Hughes; and the Bigsby Medal to Dr. G. M. Dawson, of Ottawa. The balance of the Wollaston Fund was presented to Mr. R. Lydekker; that of the Murchison Fund to the Rev. R. Baron, Antananarivo; half of the balance of the Lyell Fund to Dr. C. J. Forsyth-Major, of Florence; and the other half to Mr. G. W. Lamplugh.

Professor Victor Horsley, F.R.S., gave a discourse on Hydrophobia at the Royal Institution, on Friday, March 20th, in place of Professor W. E. Ayston, F.R.S., who was unable to give his promised lecture on Electric Meters, Motors, and Money Matters.

The last part of the "Diatomiste," edited by J. Tempère (London: W. P. Collins, 157 Great Portland Street), contains four plates. This promises to be the most important work on the Diatomacea ever issued. It is being issued every three months.

M. Fremy has been able to manufacture rubies artificially, and has produced numerous rhombohedric crystals identical with those found in nature. The rubies are produced by calcining a mixture of aluminium, red lead and potassium bichromate for several hours in an earthenware crucible.

The celebration of the Jubilee of the Chemical Society was held on Tuesday, February 24th. There was a conversazione in the evening held at the Goldsmiths' Hall, at which eight hundred were present.

A public meeting was held at the Shire Hall, Chelmsford, on Wednesday evening, the 18th March, to further the scheme of the Essex Field Club and Chelmsford Museum for the establishment of a local museum, laboratory, and library in the county town. The occasion was one of great interest, Professor Flower and other well-known scientists took part in the proceedings.

Colonel Swinhoe, F.L.S., gave a capital lantern lecture before the members of the Croydon Microscopical and Natural History Club, on March 18th, on the interesting subject of "Mimicry in Nature."

Dr. J. E. Taylor, Editor of Science-Gossip, concluded, on March 19th, a course of twelve lectures (each of which was extensively reported) in connection with the Ipswich Museum, on "The Ingenuity, Sagacity, and Morality of Plants."

MICROSCOPY.

The Royal Microscopical Society. — The February number of the journal of the above society contains, in addition to the well digested and usefully arranged "Summary of Current Researches," abstracts of the proceedings of the meetings, and the following papers :—"Some Observations on the Various Forms of Human Spermatozoa," by Dr. R. L. Maddox; and the address of the president (Dr. C. T. Hudson), "On Some Doubtful Points in the Natural History of the Rotifera."

"Journal of Microscopy and Nat. Science." —The March number contains the following papers, in addition to notes and excerpts :—"British Earthworms," by the Rev. H. Friend; "Prehistoric Man in Europe," by Mrs. Bodington; "The Evolution of Sex," by Dr. J. A. Smith, &c.

The Microscopical Society of Calcutta.— The Third Annual Report of this flourishing society for 1890 has been published. During the year the following papers were read :—By J. Wood-Mason (President), "On a Secondary Sexual Organ in the Males of certain Prawns of the genus Peneus," and "On the Changes of Skin, and on the so-called Pupa-Stage, of the Praying-Mantis (*Tenodera aridifolia*, var.);" by Dr. W. J. Simpson, "A Note on the Bacillus of Leprosy, with specimens;" by Dr. J. Stevenson, "The Microscope Stand, with some remarks on the Choice of a Microscope;" by Mr. A. Thomson, "On the Optical Principles of the Microscope;" by Mr. W. J. Lynch, "On a few Hints on the Home Construction of Appliances for the Microscope, with Exhibits;" by Mr. W. J. Simmons, three Résumés; by Baboo Bhupendrasri Ghosha, one Résumé; and by Mr. W. M. Osmond, "Bromide Enlargements of Photo-micrographs," and a Silver Print from an Enlarged Negative.

Mounting Corallines.—I have been trying to mount corallines for the microscope with the animals expanded out of their cells. I read in "Carpenter" that osmic acid would cause the animals to expand their tentacles so that they could be mounted. I have tried that acid, but with no result. Can any of the readers give me any help how to get the animals to expand their tentacles and to kill them at the same time, so as to be fit for mounting?—*W. A. Towner.*

Mounting Cochineal Insects.—To ring, try Hollis' glue. I have found this good in almost every case, and always use it to ring, for I do not like white zinc, &c., except as a finish; though I never even care for that, for the plain Hollis is all ready, and can be used for immersion objectives.—*V. A. Latham.*

Micro-Marine Zoology at Home.—Those who desire a delightful evening at home with the microscope should procure one of the jars of living marine objects sent out every fortnight by Mr. J. Sinel, of Jersey. The latest to hand contained the following specimens :—*Lucernaria auricula* (in reproduction); ova of *Inochus striatus* with embryos; *Alcyonidium papillosum*, *Membranipora pilosa*; on the red weed, one or two kinds of Campanularia and some small Polyzoa; *Crisia denticulata*, *Spirorbis nautiloides*, *Syllis armirallis*; one or two other micro-annelids; some young Rissoas; *Cystophium Darwinii*, and one or two other micro-amphipods; *Cythere reniformis* and one or two other kinds of Entomostraca; some small Planariæ; various parasitic Infusorians, Diatoms, &c., &c., on the weed.

ZOOLOGY.

Physa Acuta in Scotland.—About July, 1887, I found this shell in abundance in Banner Mill Ponds, Aberdeen, but never thought of recording the same in my journal. But, since I came to London, Mr. Jenkins, M.C.S., Deptford, on one occasion when visiting me saw them, and asked me if I had ever mentioned them, as this was a new locality. I said I never had. He took a few notes and sent to "Conch. Journ." (see vol. vi., No. 8,

p. 270). A few additional notes might be of interest. I sent to my brother, who is employed at the above factory, a note asking him to get a few alive for me, and made arrangements with him to get them here, which he did on November 21st, 1890, when he sent sixty-two live *P. acuta*, which I kept alive in tap-water for a period ranging from six to twenty-one days. Strange to say, all the largest specimens died first. The ponds they are found in are filled with hot water summer and winter, so I think the sudden change from hot to cold was the cause of death. *Limnæa peregra* is very plentiful in the same ponds, but succumbed the same as *P. acuta*. There is a distinct variety in the *P. acuta* that is white, and much larger, and the outer lip seems to approach the variety of *L. peregra*, var. *labiosa*, but pure white—a very pretty form, but not so common as type. The above specimens when put in the tap-water were quite lively, and night after night I sat and watched their movements, which were very interesting. Mr. Smith gave me the following information. He is foreman at the Banner Mill, and since he came there, that is, thirteen to fourteen years ago, they have always had a place in the ponds, for the first time he cleaned out one of the ponds he found them there, but how they got there he could not tell me, but for fourteen years they have lived and died in these ponds, and never been heard of till now. This is the first time *P. acuta* has been found in Scotland; that is to say, five hundred miles farther north than any other locality, the other locality being London, and, though not a British species, it is interesting to hear of a Continental species getting so far north. Large or small specimens of *P. acuta* are very difficult to get during the months of September, October, November, and December. Plenty of small ones can be got, but I think the larger specimens burrow in the mud at the bottom of ponds.—*W. D. Rae.*

Dwarf var. of Helix Sylvatica.—At a place about one thousand feet above Montreux, and some little distance above a bridge known as the Pont de Pierre, I have found a rather remarkable dwarf var. of *Helix Sylvatica*, Drap. The species is pretty widely distributed in the Alps, but is usually of a larger size than in the above-named locality. It belongs to the same section, *Tachea*, Leach, of genus Helix as *H. nemoralis*, Linn., and *hortensis*, Müll.—*C. P. Gloyne.*

The Flight of Birds.—In reference to the soaring flight of birds, under notice in some papers lately, I beg to offer my explanation of flotation in the air by the ability of the bird to reduce or increase its specific gravity by voluntary action. It may be surmised, it is possible that the double larynx may be the means whereby this is effected, where the trachea and two larynges may correspond to the cylinder and two valves of an air pump in pneumatic experiments, and the glass globe or dome would correspond to the lungs and air cavities in the body of the bird. The *modus operandi* may take effect by contraction of the length of the intervening trachea down towards the lower larynx, then closure of the upper larynx, followed by elongation of tube upwards towards the head. The intervening column of air inside it would then be lengthened and attenuated, and the lower larynx would then be closed, so as to preserve the attenuation in the lungs and cavities from the external air. The upper larynx would then be opened and the air let in, and the contraction of the trachea would again take place, and the action of attenuation of air as before repeated up and down. If these efforts were renewed so many times in a second, with intervals for ordinary respiration, then an ascent to one thousand feet would take place as rapidly as in any balloon. In order to establish this procedure on a scientific basis it would be requisite to take the weight of a certain bird at the level of the earth, and at a height of one thousand feet; or instead to exhaust the air out of the lungs to the extent of one inch of the barometer, and weigh it again, and also to ascertain the weight of the air in the body of the bird and its volume, at the level of the earth, and at a height of one thousand feet, or a reduction of one inch of mercury. The rapid descent of the bird would be effected by reversing the above process of air pump exhaustion, and converting the trachea and its double larynges into a force pump, so as to fill the lungs and cavities with air of a greater density. The buoyancy of the bird might then be made out for flotation in its medium, in a like manner as is done for torpedoes, diving-bells, balloons, &c., and the *modus operandi* of towering rendered more clear of comprehension.—"*Observer.*"

BOTANY.

The Flora of Kent.—Seeing your questions on the Flora of Kent in this month's Science-Gossip, I thought I would write and tell you that, having read and come across any amount of books in science, natural history, &c., I do not remember ever having seen a Flora of Kent. The nearest I know of is the "Flora of Middlesex, with Map of Botanical District," by H. Trimen, 12*s.* 6*d.*, published by W. H. Allen, 13, Waterloo Place, Pall Mall, London, S.W. If you have a copy of G. P. Bevan's "Kent," 2*s.* (Stanford's "Tourist Guide Series," published by Stanford & Co., 55, Charing Cross, London, S.W.), you will most probably find, either at the very beginning or very end of the book, the topography, history, biography, archæology, geology, mineralogy, fauna and flora, botany, mining, manufactures, and agriculture of the county. At the end of the introduction the author gives a list of the best books on the county, including botany, geology, &c. You may hear of a Kentish Flora in this way. N.B.—

This is what R. N. Worth does in his "Guide to S. Devon," same series as "Kent," published by Stanford & Co.; they are very good practical guides. I do not know whether the London Flora would include Kent; I should think it would embrace the borderland. You may find the following useful:—Bentham's "Flora," revised by J. D. Hooker, last edition, 1887, 10*s*. 6*d*.; Crespigny (C. de E.), "A New London Flora," 1877, 5*s*. I do not know of a later edition of this, nor do I know publishers' names. Any bookseller would order them, or you could get them cheaper by writing to Mr. W. Collins, Scientific Bookseller, 157, Great Portland Street, London, W., or to Mr. W. Wesley, Scientific Bookseller, 28, Essex Street, Strand, London, W.C., both of whom I can recommend; Hooker (J. D.), "Student's Flora of British Isles," Macmillan & Co., London, 10*s*. 6*d*. A revised edition of the above was, I believe, published about 1887.—*F. Leigh.*

The Variations of Colours in Plants.—It may be interesting to readers of Science-Gossip to give a few instances of variation in colour of the same species of plants which have come under my notice. Some flowers are more various in colour than others. For instance, the common wild geranium may be found of a dark red, and light red of various shades, and is sometimes so pale as to appear almost white. The purple orchis of our meadows are of a very dark purple, others of a lighter hue, and some of a very pale red colour, while others may be found of a pure white colour. The flowers amongst which we find most examples are those of a blue, red, and purple colour. Among blue flowers I have noticed the following variations in colour. The selfheal is generally of a dark blue colour, but many flowers are lilac, though some may very often be found of a pure white; and the sweet violet and milkwort may often be seen of a blue, red, and white colour, and now and again a white specimen of the pretty little harebell may be gathered, but the colour is not a common one among them. We have more instances of variation in red and purple flowers than in any other colour, and I think I shall not be far wrong in stating that there are more examples in the two mentioned colours than in all others put together. The red campion, which is dark red, may be found of a very pale red colour, or almost white. The common knapweed changes in colour, and may sometimes be found white, while red clover may be seen of similar colours. Rest harrow is as various in the red colour as those just named, and is frequently white. The scarlet poppy and scarlet pimpernel, two flowers of our cornfields, though of so dark a colour, are often light red or even pink. The little field madder and field knautia may be found of various red colours, while white specimens of the purple foxglove and heather are of common occurrence. The lesser convolvulus is white and rose colour, the wood anemone is sometimes rose-coloured, and the common yarrow is occasionally red, while the common daisy of our meadows is often fringed with red. The pretty yellow flowers of the bird's-foot trefoil have often a mixture of red, and some are entirely red, while the wild pansy of our cornfields may be found of various colours.—*H. G. Ward.*

Chlorophyll and Light.—At least a brace of topics have been recently discussed in Science-Gossip that challenge a more than passing comment. One is the formation of chlorophyll in plants. It seems to be allowed by all the big botanical authorities that there are exceptions to the law that light is an indispensable condition for its formation. The germinating seeds of many coniferæ, and the fronds of ferns, for example, become green even in absolute darkness when the temperature is sufficiently high, and a bright green moss has been fished up out of the Lake of Geneva from a depth of two hundred feet. But let us take care that there be no mistake here. Are we quite sure that in every instance where a suit of green is worn by a plant fabric that the colour is due to chlorophyll? If we have got any decent sort of eye for colour at all, and endeavour to match the tint of a green gooseberry, for instance, with that of a beech leaf, shall we be satisfied? I fancy not; and wherefore? Simply because the colouring matter in the one case is not the same as that in the other. By personal experiment, I have become convinced that green elderberries and even the seed cases of the sycamore contain no chlorophyll; and I suspect that the green cotyledons found inside the melons and likewise that of the lemon, recorded in this journal, contain none either. But how can you tell that? what do you know about it? Well, I must appeal to the evidence of that most scientific of all instruments, viz., the spectroscope. An alcoholic solution of the substance in question, a small spectro, the use of an eye and a little brains, and the trick is done, the matter is decided. By reference to a back number of Science-Gossip we learn that a very thin layer of chlorophyll is sufficient to absorb all the orange, blue, and violet rays contained in the incident light; hence the spectrum ought to show very decided dark absorption bands in the portions thereof occupied by these rays respectively when white light is transmitted through a prism. When, therefore, an alcoholic tincture of, say, grass leaves is presented to the slit of the spectroscope, a very dark, broad, clearly outlined band is seen in the orange next the red, and the whole of the blue-violet portion is blotted out; sometimes two or three other fainter bands are also seen in the yellow and the green, but these are not characteristic as the former are. So far as I am aware, there is no distinctive chemical test for chlorophyll; as it is highly probable that it is not invariably of the same chemical composition, nor is it in every case evolved from precisely the same organic constituents in the plant. The physical test now indicated is the only reliable means of detecting its presence; and therefore any solution not yielding the absorption spectrum aforesaid cannot be said to contain chlorophyll. This comment raises a further suggestion as follows. On reading the illustrations of vegetable teratology, so tastefully exhibited by the editor in last year's volume, many examples may be noted where sepals, petals, and other floral parts have been converted into green leaves or green foliar organs, or *vice versa*. The quandary here is to definitely settle the highly interesting and important problem whether these verdant appearances are really due to chlorophyll or not. It is obvious that a decisive solution either one way or the other would tend to eminently fortify or to seriously undermine the famous "Gothic" conception that floral organs (sepals, petals, stamens, &c.) are developed, or are modifications of foliar organs. Any vegetable outgrowth whatever, though it be as green as the emerald, and present a foliar aspect and structure, cannot, if destitute of chlorophyll, be regarded as a leaf in any functional sense of the term.—*P. Q. Keegan.*

Note on Scolopendrium vulgare, var. Lobatum, and its allies.—During a recent walk (5th March) from Aust, Gloucester to Bristol, I found the roadsides, owing to the absence of other vegetation, very favourable to the observation of ferns. In sheltered places, notwithstanding the severity of the past winter, I noticed some fine specimens, chiefly of the common hart's-tongue, as green as at midsummer. The majority showed, by their semi-withered state, the advanced time of year; but, as a whole, I should be inclined to think that the excessive and long-continued cold has not unfavourably affected them. I was fortunate in finding two or three good, and, I hope, constant varieties, which I have yet to name or get named, and a very large number of specimens of the variety above mentioned. In looking at Swayne's old work on the Botany of the neighbourhood, I find but a single variety recorded, and that from the neighbourhood of Ashton; but, of course, very much more must be known since the date of the publication of that book; but I regret that I am unable to refer your readers to these sources of information. The Botanical Secretary of the Bristol Naturalists' Society is editing in its Proceedings a very valuable record of the local flora; but I expect that the cryptograms have not as yet been dealt with. The variety Lobatum may be looked upon as occupying a middle place between the simply bifurcated fronds and those which are much dissected and tasselled; all of them are undoubtedly related, and very inconstant, especially when transplanted, reverting almost invariably to the specific form. This fact has always been known to collectors and growers of British ferns. Ferns gathered with dormant fronds in spring burst during the same season. In the natural state the amount of variation on the same plant is very great, extending from a simple tendency to bifurcate at the growing point of the midrib, and hardly visible on the margin, to a distinct separation of the fronds on a common stipe, a simple form of pinnation. This is the most notable case that has come under my own observation; but I have not as yet observed a sufficient number of plants to be able to say much as to the amount of variation in fronds growing from a single crown. Varieties, when they occur in nature, I find often occur together, and sometimes it requires a careful examination, by digging up the roots, before the fronds can be relegated to the crowns that support them. Although this variety, Lobatum, and its bifurcated and tasselled allies is generally distributed over the neighbourhood of Bristol, it can hardly be said to be common, except in a few favoured localities. Indeed, I have travelled long distances along our Somersetshire and Gloucestershire lanes without observing a single specimen. Speaking generally, I fancy they are rather more frequent in sheltered situations near the coast; but in returning from Aust to Bristol on the date mentioned, I observed so many that I thought the fact deserving of mention. In a lane running east and west on Keuper soil, near Aust, 90 yards long, with high banks, well shaded by hedges and elms, I counted no fewer than 117 separate plants, varying from simple bifurcation to strong cresting at the opposite extreme, the majority belonging to the intermediate variety Lobatum. These were nearly all strong, growing, handsome plant clusters, which, if divided, would double or treble the above mentioned number. Of the total number of Scolopendrium plants, normal and abnormal, I should think, at a rough estimate, that the bifurcate and crested kinds must number probably a third. Both sides of the lane are sheltered and shaded by trees, but naturally the south side more than the other. Of the 117, 40 grew on the side facing the sun, and 77 on the other, a difference of nearly a half, and this difference would be true for the normal forms also. In the close vicinity, but on the sides of the main road, I observed several plants of the same variety. Proportionally, however, they were much scarcer. Both localities have a southern exposure.—*T. Stock.*

GEOLOGY, &c.

Anniversary Address of the President of the Geological Society.—Dr. A Geikie delivered the above address on February 20th. He dealt with the history of volcanic action in Britain during the earlier ages of geological time. He proposed to confine the term "Archæan" to the most ancient gneisses and their accompaniments, and showed that these rocks, so far as we know them in this country, are essentially of eruptive origin, though no trace has yet been found of the original discharge of any portion of them at the surface. Passing to the younger crystalline schists, which he classes under the term "Dalradian," he pointed to the evidence of included volcanic products in them throughout the Central Highlands of Scotland and the North of Ireland. The Uriconian series of Dr. Callaway he regarded as a volcanic group, probably much older than the recognised fossiliferous Cambrian rocks of this country. The Cambrian system he showed to be eminently marked by contemporaneous volcanic materials; and he discussed, at some length, the so-called pre-Cambrian rocks of North Wales. He reviewed the successive phases of eruptivity during the Arenig and Bala periods, and described the extraordinary group of volcanoes in northern Anglesey during the latter time. The volcanoes of the Lake District were next treated of, and reference was made to the recent discovery by the Geological Survey that an important volcanic group underlies most of the visible Lower Silurian rocks in the South of Scotland. The last portion of the address was devoted to an account of the volcanoes of Silurian time in Ireland, and it was shown that during the Bala period a chain of submarine volcanic vents existed along the east of Ireland from county Down to beyond the shores of Waterford; while in Upper-Silurian time there were at least two active centres of eruption in the extreme west of Kerry and in Mayo.

Fossil Fish in Lower Silurian Rocks.—A remarkable discovery is announced from America. The enormous number of fishes which so suddenly make their appearance in the Old Red Sandstone or Devonian, have always staggered evolutionists. The only reply was "the imperfection of the geological record"—the failure to come upon the rocks containing those experiments of nature which would supply the missing links. These, however, have now been discovered in western America. In the Lower Silurian sandstones near Cañon City, Colorado, there have been found hosts of fishes of a lower type than those in the Upper Silurian or Devonian. They are also the oldest backboned animals as yet known, and indicate that when the still more ancient Cambrian is fully investigated transition between the vertebrate and the invertebrate groups may be unearthed.

NOTES AND QUERIES.

Fungus Growth on Eggs.—Can any reader of Science-Gossip suggest a remedy for a fungus that has got into my collection of eggs. It can be rubbed easily off coloured eggs, but leaves a dark mark on white eggs. The collection is kept in a thoroughly dry room, in drawers, covered with glass. All the specimens of my own collecting were well washed out. What can have caused the fungus? I intend putting carbolic acid in each drawer to keep off moths. Will that have any effect in checking the fungus? I am told that carbolic acid is preferable to camphor, as the latter tends to produce dampness. Will the common brown acid do, or must it be the refined kind that is used?—*T. Brown.*

Local Conchological Society.—Being anxious to discover if there are any Conchologists in Exeter and neighbourhood who would join myself and friends here in establishing a local society, I should feel grateful if you would kindly allow me a few lines in your much read and widely circulated magazine for that purpose. Collectors in this part of England labour under disadvantages unknown to those living in the more favoured north. Every little piece of knowledge has to be painfully acquired. There are no well-known specialists to apply to; no museums with good local collections to which we can refer when difficulties arise. A walk through the Exeter Museum quickly shows how little general interest is taken in Conchology and Entomology in this county. There is certainly an attempt at a local collection of land and fresh-water shells, but to my knowledge it has not been added to, or re-arranged for years, and several of even the commoner local forms are misrepresented. A few persons interested in the science, who would co-operate and meet together from time to time for mutual encouragement and instruction, would undoubtedly very soon succeed in rendering this a less "dark" district, and if thoroughly worked I am very sure it would soon prove itself a very rich one, as with but few opportunities for collecting I have already found several species not in the county list.—*L. J. S., Topsham, S. Devon.*

The Great Yarmouth Natural History Society held their annual meeting at the Free Library on Tuesday evening, January 27th. The Secretary read the annual report which showed the Society was financially better than last year. Notes were read on the black-headed gull, and long-eared bat, a living specimen of which was exhibited. Letters from the President, Sir James Paget, Rev. M. C. H. Bird, and Rev. E. N. Bloomfield, with which the latter gentleman enclosed a copy of his "Lepidoptera of Suffolk," and "Moss Flora, and Hepaticæ," of the same county. The papers read at the ordinary meetings were as follows: "Bird Mortality," "The Little Gull," "The Sole," "The Great Sirex," "Skulls of Birds," "Microscopic Fungi," "The Black Rat," "Bees and Bee-keeping," "Five-bearded Rockling," "Fifteen-spined Stickleback," "The great Water Beetle," &c.

Cuckoo's Egg in a Greenfinch's Nest.—It is not, I think, a very frequent occurrence to find a cuckoo's egg in the nest of a hard-billed bird, being mostly found in the nest of the hedge-sparrow, and in the nest of other warblers. It may be interesting to some to know that a cuckoo's egg was discovered here in the spring of 1887 in a greenfinch's nest, which contained four eggs of the greenfinch.—*H. G. Ward, North Marston.*

The following interesting occurrence, which was told to my cousin, who related it to me, may perhaps be interesting to readers of Science-Gossip. In a hedgerow around this village a blackbird built its nest last winter and laid five eggs, which were eventually hatched, and the young ones flew away. The young man who knew the nest, used, it seems, to visit it occasionally to see how the young ones were getting on. In one of his visits he found that the young ones had flown, and was greatly surprised to find three more eggs laid in the old nest. I should be pleased if readers would record any similar instance which might have come under their notice. —*H. G. Ward*, *North Marston.*

THE TWO SIDES OF THE MEDAL.—Mrs. Bodington, in a not altogether novel parable, urges us to look on both sides of the medal, but gives little evidence of viewing more than one side of it herself. She is apparently more a follower of Spencer than of Darwin, but while she twits Wallace for not being abreast of the march of science, she herself clings to some of the most doubtful of Darwin's assumptions. Of Wallace, she writes: "He believes in natural selection pure and simple, with its odd theory of constant variations occurring without any reason, and owing their origin to nothing in particular." Well, to what do these variations owe their origin in Mrs. Bodington's opinion? They are due to the "law of the action of the environment upon irritable protoplasms"—an explanation highly abstract and more metaphysical than biological. True, probably, as far as it goes, but not going very closely to the point. Now, Wallace, without thinking it worth while to give this account of the origin of variations, has placed the theory of natural selection on a much stronger basis than that on which Darwin built it. Wallace has shown that variations are, as a matter of fact, numerous in all directions. While every organism has a normal or average form and size for all its parts, both internal and external, yet no individual exactly hits this average, but all vary, in all their parts more or less, from the average form and size. For instance, suppose a bird has a wing of a certain length, and it would be to its advantage to have a somewhat longer wing. Now about half the individuals of the species must always have a little more than the average length of wing, while the other half have a little less than the average. The former will tend to prosper and propagate their kind, while the latter will decrease. The process begins at once. There is no waiting for fortuitous variation, as Darwin thought. Now, as for the transmission of acquired characters, when we find two men so widely apart in their general views as Wallace and Weissman unite in repudiating that doctrine, we must at least believe that a great deal can be said against it, and that the question cannot be settled so simply as Mrs. Bodington imagines. From the off-hand way in which she settles the matter, it is evident indeed that she does not clearly understand the question at all. She confounds the doctrine of inheritance of acquired characters with heredity in general. She strangely quotes the transmission of the peculiarity of supernumerary fingers as the transmission of an acquired character. She also refers to the transmission to offspring of phthisis and insanity; but the whole question hinges upon whether these disorders were acquired or congenital. As a great authority stated recently, the actual evidence in favour of the transmission of characters really acquired in the individual's lifetime amounts only to a few scattered anecdotes. I will only say in conclusion that Professor Weissman's theory of the continuity of the germ plasma is far from being as baseless in fact as Mrs. Bodington supposes. In numerous cases it is demonstrable that the reproductive cells or the rudiments of sexual organs are set apart at an early stage, in the development of the embryo. "They thus include some of the original capital of the fertilised parent ovum intact, they continue the protoplasmic tradition unaltered, and when liberated in turn they naturally enough develop as the parent ovum did." Preconceived theories may sometimes blind men to facts; but a scientist of the calibre of Professor Weissman does not adopt his theories without some foundation in fact. The transmission of acquired characters is by no means essential to Darwinism. The essence of Darwinism is the principle of natural selection, and this must stand as a *vera causa*, and as one prime factor in the process of evolution, whatever the other factors may ultimately be proved to be.—*J. W. Baylis*, 56, *Vine Street*, *Liverpool.*

COLOURS OF EGGS.—It is a curious fact that, while we have more or less plausible reasons by which we account for the varied colours of birds, beasts, insects, and flowers, we seem to have no clue whatever to the reason for the equally beautiful and wonderfully-varied tints of birds' eggs. It is true, certain generalisations have been attempted. The basis of many of these is that the colours bear some relation to the environment, a protective function being assigned to them. M. Glöger, a German naturalist, many years ago followed this fancy to a considerable extent, and it is frequently still propounded in popular articles in various journals. According to these theorists, eggs are divisible into two classes: self-coloured, and spotted. Simple whites, blues, greens, and yellows, are considered to be most conspicuous, and therefore most dangerous, and these are said to be therefore hidden in hollows or covered nests; the colours of speckled eggs are supposed to blend with the shades of surrounding objects, or with the lining material of the nest. Of course these theories have no foundation in fact, and in every case the exceptions are as numerous as the examples adduced. Any schoolboy who has gone bird-nesting could produce abundant evidence to refute these notions of cabinet theorists. Dr. Darwin ascribed the colours of eggs to the objects amongst which the mother-bird lives, acting upon the shell through the medium of the eye. Others have surmised that there may be some relation between the colour of the plumage and that of the eggs. Perhaps the plumage of our domestic fowls varies more than that of any other birds, yet they lay simple white or yellowish eggs, singularly unliable to vary. Chemists have recently brought their science to bear on the subject, and their investigations have led, I believe, to the discovery of two new compounds in the pigment of the egg of the emu, these were detected by means of the spectroscope. Abnormal varieties of eggs are worth recording; and I notice, with pleasure, that several of your readers are acting in accord with Mr. Nunn's suggestion, and forwarding to you reports of such variations as they have met with. As in botany, so in this department, what were once called monstrosities may act as guides to the past history of the species, and some clue may be found which will enable us to unravel what is at present an inscrutable mystery in zoology. In my own experience I have met with some interesting varieties. White forms of normally deeper-tinted or spotted eggs are by no means rare. The robin often lays a pure white egg in a clutch of normal ones, and in two instances I have met with the entire clutch pure white; the guillemot very frequently lays eggs almost devoid of spots, but absolutely spotless specimens, although they do occur, are rare. Other white varieties I have met are those of the sparrow-hawk, greenfinch, canary, jackdaw, linnet, house-sparrow, and wren. But the most interesting case in this direction was a clutch of eggs of the red grouse, these were all pure white except one, which was slightly clouded with the faintest approach to coloration. Normally-spotted eggs frequently occur without markings, as in the song-thrush and many others (including in one case the rook). On the other hand, self-coloured eggs but rarely become accidentally maculated. I have seen eggs of the domestic fowl slightly spotted, and one particular hen during the whole of her laying career, produced somewhat heavily-dappled eggs, approaching in colour to those of the turkey. Eggs of the stonechat and whinchat seem to have dotted and undotted eggs with almost equal frequency, so that neither can be called decidedly the normal state. A pair of dark chestnut-mottled eggs of the green woodpecker were taken near Kipling, in Yorkshire, in 1881. These were exceedingly richly-coloured. Variations in the ground colours of eggs are less frequent than those of the markings. White jack-daw eggs with black markings are frequent in Cleveland, and are very handsome when heavily-spotted. The partridge-egg, with the small end green, described by Mr. Hewitt, and which I have seen, is a very remarkable freak. The markings themselves of eggs perhaps afford the most examples of aberration from the normal, but of these I cannot now treat, but will try to describe a few I have met with in a future note.—*J. A. Wheldon*, 32, *Langham Street*, *Ashton-under-Lyne*.

Batrachomyomachia.—So far as I know, before the days of Homer, no battle between frogs and mice and rats has been recorded. The blind bard gives us the origin of the famous contest he describes; but those which I am about to relate appear to have been brought about in a different manner. Some little time ago a friend living at Comptom, Sussex, witnessed a singular spectacle; in this case toads instead of frogs had fallen victims in an engagement. A legion of rats had assailed a small army of toads and rent them limb from limb, as their mutilated carcases testified. They did not appear to have devoured many of the toads. Perhaps, having tasted them, they did not like them. Last week a strange combat took place at Chichester, of which I extract the following account from the "West Sussex Gazette": A rat and a frog were found near the stables of Dr. Buckell, East Pallant, having met their death in mortal duel. The rat had seized the frog's head, and its teeth protruded through the eye; the frog had also taken a firm grip of its opponent. Both declining to release their hold, or perhaps being unable to do so: they had probably died of starvation. This strange couple are to be preserved for the Chichester Museum. What could have caused this quarrel? The rat was of Hanoverian or German extraction, and the frog possibly of French origin, which would at once account for it; but, as there is no evidence as to the latter, perhaps a different reason may be assigned. Does any correspondent know of similar battles recently?—*F. H. Arnold.*

Mounting Shells.—I have collected shells for some years, and have used gelatine (that sold at the confectioners in pellets) to fasten them on card tablets, melting it like glue in a vapour bath, but on floating some of the shells off I find a mark where the gelatine has been, and am afraid it injures the shells. Can any reader advise me on the matter?—*Mary Priest.*

Heredity.—In the great discussion now going on as to whether any modifications acquired during the life of the parent are transmitted to the offspring, can any one give any information as to the size of feet of Chinese babies, after fashion for centuries has crushed in the feet of the mothers? Darwin, I think, mentions the peculiar canter of Shetland ponies as being due to the boggy nature of the ground across which they run wild so long. At a loan exhibition held here, I was amazed at the small size of a pair of Chinese women's shoes exhibited. They were more like shoes for a six-months'-old baby in this country, or for a doll, than for any adult.—*J. Shaw.*

Rat Stories.—The following stories of rats were communicated to me by a person living at Cushendall, co. Antrim. A farmer living near the village had a cask full of pickle for curing meat. This cask was placed near a shelf on which was a dish where three large crabs had been placed; one of them was boiled, the other two were alive. A rat prowling for food smelt the cooked fish, and had just commenced his meal when one of the crabs seized him by one of the forelegs and held such a grip that both tumbled over into the pickle. The farmer coming next day to get the crabs, wondered extremely what had become of one of them, and thought it was stolen, and after searching about discovered it and the rat at the bottom of the cask, the crab still holding on firmly. Both were drowned. Another rat was observed by a farmer in the month of April, when rats leave the rick-yards for the fields, to be assisted on his journey by two rats, one on each side, supporting him by a stick which the maimed rat held in his mouth. This rat had evidently been caught in a trap, as both his forelegs were broken. This, I think, shows reasoning.—*S. A. Brenan.*

Classificatory Position of the Mollusca.—Can anybody state, as succinctly as possible, the precise reasons why the Mollusca have been placed in a higher position in the scheme of animal classification than the Annulosa?—*P. Q. K.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

Uva Ursi.—Write to the secretaries of the Chemical Society, and also to the secretary of the Institute of Chemistry, for rules of admission.

W. F.—You will find "The Journal of Microscopy and Natural Science," published at 6*d.* monthly (London: Baillière, Tyndall & Co.), very useful. "The Microscope" (an American Journal), may be had of Mr. W. P. Collins, 157 Great Portland Street, London, W.

S. J. Bebac.—Write to Mr. W. J. Cain, Hon. Sec. Isle of Man Natural History and Antiquarian Society, Woodburn Square, Douglas, for information respecting the lepidoptera of the island.

W. D. R.—We hope to print your list of Aberdeen shells shortly.

T. R. J.—The green variety of *Fluor-spar* is seldom if ever found in Derbyshire. It is met with in fine, large cubic crystals (truncated) in and about Alston Moor, Cumberland. The miners there generally have a collection of it.

R. D.—Climbing plants do not necessarily all turn the same way—so as "to face the sun." Lapageria is not an exceptional instance of plants "turning the same way as the sun," although most climbing plants are right-handed, such as scarlet runners and convolvuluses; others, like the hop, are left-handed.

O. C.—It is not uncommon to find wild snowdrops in the state of those you sent.

E. W. S., AND OTHERS.—You can procure Verrill's "List of British Diptera," by addressing the author at Newmarket.

WE have received No. 107 of Messrs. Wesley & Son's "Natural History and Scientific Book Circular," Part 2, devoted to botany. We shall esteem it a favour if our correspondents will write with ink instead of lead-pencil.

J. E. NOWERS.—Send the paper you mention, and we will do our best with it.

M. B. DAVIES.—If you will forward the specimen of amber to the publishers of SCIENCE-GOSSIP, we will endeavour to find the kind of insect imbedded in it.

J. H. ELLIS.—Get the "Saturday Afternoon Holiday Guide near London," price 6*d*. It will give you localities for fossils, &c.

EXCHANGES.

WANTED, correctly-named hymenoptera and diptera. Good return in land and freshwater shells.—J. W. Williams, 57 Corinne Road, Tufnell Park, N.

Valvata cristata and *Ancylus lacustris* wanted. Also exchanges with those who have good collections of the band variations of *H. nemoralis* and *H. hortensis*.—Rev. J. W. Horsley, Woolwich.

OFFERED, *Xylophaga dorsalis*, and *pholas* with siphons. Wanted, *Pecten tigrinus*, *Striatus testæ* and *septemradiatus*, *Lima elliptica*, *subauriculata* and *loscombii*, *Modiolaria nigra* and *marmorata*, *Crenella decussata*, *Lepton nitidum*, *Lucina spirifera*, *Isocardia cor.*, *Axinus ferruginosa*, *Astarte triangularis*, *Psamobia tellinella* and *costulata*, *Lyonsia Norvegica*, *Panopea plicata*, *Buccinum Humphreysianum*, &c.—J. Smith, Monkredding, Kilwinning.

WANTED, L. C., 8th ed.: 11, 114, 848, 855–858, 861, 862, 867, 870, 983, 1253 and var., 1350, 1596*b*, 1598*b*, 1604, 1808, &c., in good specimens (British only). Will give in exchange 76*c*, 116, 147*c*, 192*b*, 421*b*, 423, 915 fol., 539*b*, 541*b*, 541*c*, 546, 549, 572, 924, 1310, 1666, 1675, &c.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

NOS. 49–63 (January, 1869, to March, 1870), and Nos. 180–253 (December, 1880, to January, 1886) of SCIENCE-GOSSIP in exchange for micro apparatus. Side reflector wanted.—A. Johnston, 184 Slatefield Street, Glasgow.

AUSTRALIAN eocene fossils. A fine collection offered for other fossils.—J. T. Mulder, Moorabool Hotel, Geelong, Victoria, Australia.

WILL any geologist having a knowledge of any accessible fossiliferous geological sections near London, kindly communicate with J. H. Ellis, 1 Pomona Place, Fulham, S.W.?

NAMED and unnamed fossils (good assortment) given in exchange for foreign stamps. Old issues required.—A. Tarver, 34 Croydon Grove, Croydon.

WANTED, Smith's "Diatoms," and Lindsay's "British Lichens." State requirements to—J. Larder, Mercer Row, Louth, Lincs.

WANTED, British land and freshwater shells, or any fossils from any formation not in collection, with names and where found, in exchange for *Pholas candida*, or pressed British flowers. Address—R. D. Laurie, 19 Willow Bank Road, Birkenhead.

FIFTY foreign postage stamps, all different, in exchange for eight different foreign coins.—Stampus, 24 Sidney Grove, Newcastle-on-Tyne.

WANTED, someone who would be kind enough to name a collection of shells (gratis) if sent few at a time. Would be welcome to duplicates.—Edward Buckell, Romsey.

SCIENCE-GOSSIP for 1887–89, unbound. Wanted, old collection of postage stamps for whole or portion.—D. Thomson, 81 Kyverdale Road, Stoke Newington, London.

NEW Zealand shells wanted to exchange for shells of other countries, Correspondence invited. Address—G. W. Wright, Karanaghope Road, Auckland, New Zealand.

WANTED, foreign shells and good unmounted micro material. Exchange British shells and choice micro slides of every description. Foreign correspondence invited. — R. Suter, 5 Highweek Road, Tottenham, London.

BRITISH reptiles and batrachians. Wanted, perfect adult living or spirit specimens, in exchange for correctly-named foreign species, or other objects.—G. E. M., 5 Warwick Place West, London, S.W.

"ROYAL Microscopical Journal" for 1887 and 1888, 2 vols., bound, and four parts, February to August, 1889; also "The Microscope," by H. Baker (1769). What offers?—F. C., 53 Brooke Road, Stoke Newington, N.

DAVIS'S "Biology," Gibson's ditto, Marshall and Hurst's "Zoology," Lloyd Morgan's ditto, Bower's "Botany," Parts 1 and 2, Huxley's "Biology," &c., in exchange for good standard works on geology, or a good labelled collection of minerals, rocks, &c., to illustrate lectures on physiography. Offers to—A. E. Salter, Royal Masonic Schools, Wood Green, N.

SCIENCE-GOSSIP (unbound), 1889 and 1890, complete, 8 numbers for 1880, and 10 odd numbers, for exchange. Wanted, transparent molluscan micro-slides, or offers.—J. B. Beckett, 11 Lancaster Road, Great Yarmouth.

OFFERED, *Pholas candida* (perfect living shells). Wanted, the rarer species of British land and freshwater shells, also good marine species.—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

"IBIS," bound half-calf, for 1881, "Supernatural in Nature" (Reynolds), perfectly clean and good as new, in exchange for eggs, or natural history works especially relating to Derbyshire.—Miskin, Steam Brewery, Bedford.

Spirula Peronii, *Waldheimia flavescens*, *Trigonia Lamarckii*, *Ianthina exigua*, and other good shells. Wanted, good foreign or British land and freshwater shells.—Robert Cairns, 159 Queen Street, Hurst, Ashton-under-Lyne.

"Vegetable Substances," 3 vols. "Lib. Ent. Knowledge," in exchange for text-book on Practical Botany. Also wanted modern work on marine algæ. J. F. Neeve, 68 High Street, Deal.

OFFERED, *Cypræa helvola*, *C. annulus*, *C. lynx*, *Oliva ispidula*, *O. tremulina*, *O. reticularis*. Wanted, *Nassa immersa*, *N. gemmulata*, *N. papillosa*.—W. Jones, jun., 27 Mayton Street, Holloway, London, N.

"POPULAR Science Review," 1887 and 1888, in 1 vol., "Geological Survey, Canada, Report for 1853–1856," 1 vol. Offers wanted.—J. A. Floyd, 5 Hospital Road, Bury St. Edmunds.

FOREIGN stamps wanted. Will give British shells in return. —T. E. Sclater, Bank Street, Teignmouth.

OFFERED, birds' and animals' skins, birds' eggs, shells, photographic camera and apparatus, &c., in exchange for foreign stamps.—H. Knights, Beaconsfield Road, Great Yarmouth.

Lima hians, *L. Loscombii*, *L. Sarsii*, *L. elliptica*, *Modiolaria costulata*, *Crenella rhombea*, *Arca obliqua*, *Axinus croulinensis*, *Ampidesma castaneum*, *Tellina balaustina*, *Panopea plicata*, *Teredo Norvegica*, *T. pedicillata*, *Trochus amabilis*, *T. Dumingii*, *T. occidentalis*, *Rissoa Jeffreysii*, *Jeffreysia diaphana*, *Cerithiopsis metaxa*, *Eulinia stenostoma*, *Odostomia decussata*, *O. conspicua*, and *Stylifer turtoni* wanted. Other rare British shells given in exchange.—A. J. R. Sclater, 23 Bank Street, Teignmouth, South Devon.

PHOTOGRAPHIC sets. One ½-plate set, one slide, lens and tripod complete; a ¼-plate set by Lancaster, two double slides, &c., all complete, in real good order. I will exchange for appliances or books on microscopy, biology, brewing, &c.—Apply—Horton, Brayford, Lincoln.

BOOKS, ETC., RECEIVED FOR NOTICE.

"An Introduction to the Study of Botany," by Dr. E. Aveling (London: Swan Sonnenschein & Co.).—"Mineral Resources of the United States," vol. for 1888.—"Monograph of the U. S. Geol. Survey—Lake Bonneville," by G. K. Gilbert.—"Ninth Annual Report of the U. S. Survey for 1887–88."—"Bulletins of the U. S. Geol. Survey," Nos. 58–60 (all published at Government Printing Office, Washington).—"A Class Book on Light," by R. E. Steel (London: Methuen & Co.).—"The Foundations of Chemistry," by E. T. Dixon (London: Geo. Bell & Sons).—"Insect Life," vol. iii. No. 5, by C. V. Riley and L. O. Howard (Washington: Government Printing Office).—"Report of Wellington College Nat. Science Society, 1890."—"Journal of the Royal Microscopical Society," February.—"Nature Notes."—"British Cage Birds," Part 11. —"Le Diatomiste," No. 4.—"Journal and Proceedings Royal Society of New South Wales."—"The Medical Annual, 1891." —"American Microscopical Journal."—"The Microscope."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Garner."—"Feuille des Jeunes Naturalistes," &c., &c.

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

A MARSH GARDEN.

NOW that the happy time for all botanists is coming on, I think it may interest those who have like myself a special love for bog-plants, to hear of a successful experiment made by me for two successive seasons.

I set up a miniature marsh thus: I took off with a trowel, so as not to disturb the roots, some patches of the bog surface, containing plants of the pinguicula, others with clusters of different sorts of drosera, patches with masses of the tiny bog campanula, also some young plants of the bog asphodel. I packed my patches of bog tightly in a shallow seed-pan and added to them *Parnassia palustris* sent to me from Scotland and filling up all the interstices with growing bits of moss. I then placed my pan in one sufficiently large to allow of two inches between the inner and outer pans on all sides. The holes of the outer pan were carefully plugged and filled with water which oozed naturally up through the holes in the bottom of the inside pan, and placed the whole upon a sunny window-sill. The water drawn up by the sun kept the contents not only soft and wet, but kept a warm soft atmosphere about the plants, such as they had in their native habitat. If any of your readers ever put their face down close to a bog to look closely at its exquisite vegetation on a warm sunny day, they will understand the soft warm breath the plants rejoice in.

The little marsh garden succeeded beyond my most sanguine expectation, the plants never felt they had been taken from their native land, but grew apace and blossomed well, the pinguiculas threw up their lovely purple-headed stems, the sundews sent up numberless bunches of their little white flowers, the campanulas were plentiful, and the Scotch parnassus flourished and blossomed as well as if it was on its own mountains.

To my great delight I had several unexpected ornaments to my marsh garden. A crop of pink pimpernel made its appearance, and grew with such speed and luxuriance that they had to be removed to a flower-pot saucer, where they hung over the edge after a very short time in beautiful pink wreaths. Next, a small marsh hypericum came to light and embellished my marsh with its small trails of yellow flowers and red buds. Then a small green flower surprised me one morning by making its appearance in the centre of a patch of spear-shaped leaves that I had supposed to be some sort of grass, a small deep cup-shaped blossom, its corolla five-cleft with a stamen in the curved centre of each division, and a shining moist spot in the heart of the cup instead of a pistil. The number of small mosses was most interesting, some of them of exquisite beauty; they came and went in a constant succession during the early spring—March and April—but there was always some curious plant or other quite unknown to me during the whole summer.

After a few months the water between the pans became the home of numerous small water insects, and two sorts of water snails made their appearance. For their benefit and shelter I put a plant of water-cress in one corner of the water, which speedily threw out roots and flourished, making a shelter for the insects.

I kept the outer pan filled to about an inch under the rim of the inner one, in hot weather it evaporated very quickly, and I was careful to keep the water even with the mark.

If any of your readers think of setting up a marsh for themselves I am sure they will find it a source of endless interest and pleasure.

NOTE.—The campanula mentioned above I was unable to identify; it was like *C. hederacea*, but smaller, and the blossoms upright instead of drooping.

I. G.

THE STRUCTURE OF INSECTS IN RELATION TO THE ORIGIN OF VERTEBRATES.

PROFESSOR B. T. LOWNE, F.R.C.S., recently delivered at the Royal College of Surgeons three lectures on the Structure and Development of the Skeleton of the Head, the Nervous System, and Sensory Organs of Insects in relation to Recent Views on the Origin of Vertebrates, giving the results of work in which he has been engaged for at least fifteen or twenty years. His views are that the vertebrate and the arthropod stand in a genetic connection with each other. He said: "If we seek for links uniting these two great sub-kingdoms, we must look for them amongst the most generalised groups in each: in the vertebrata amongst the amphibia, and especially the perennibranchiate forms; in the arthropods, and in the king-crab "Limulus," which hold a zoological position between the arachnids and the crustacea." The lecturer compared the embryos of the axolotl, as figured by Professor Parker with arthropod embryos, and showed many points of similarity. He then adverted to the fact that both Drs. Gaskell and Patten had independently arrived at the conclusion that the king crab stands in a genetic relation to the vertebrata.

The existence of a notochord in the chordata has been looked upon as of primary import in the question of the descent of vertebrates from an invertebrate type. Adopting, however, Gaskell's views, and holding that the central canal of the spinal cord represents the arthropod alimentary canal, the lecturer showed at some length that the proctodeum of the insect embryo corresponds with the mesenteron of the vertebrata; and he held that a notochord should rather be regarded as a secondary character, resulting from an invagination of the epiblast, than as a structure of a high morphological significance; and he showed that a rod of cartilage, similar to a notochord, is actually developed on the dorsal surface of the invaginated head capsule of the blowfly larva, whilst those structures in invertebrates which have been supposed to represent a notochord have a similar origin. He pointed out that the structure which supported the nerve centres in Limulus, is composed of cartilage very like the cartilage of the vertebrata, and it could only, with great difficulty, be distinguished from it. Professor Ray Lankester was the first who made out this peculiar form of cartilage, which he said was developed from the mesoblast; while the lecturer, judging from the relation the structure bears to the same parts in insects, believed it to be an epiblastic structure. This led him to accept the view put forward by Dr. Patten in America and by Dr. Gaskell in this country, that the ventral surface of the anterior somites of the arthropods represents the basis cranii of the vertebrata. The relationship between the nervous system in the vertebrates and the arthropods led him to adopt Dr. Gaskell's hypothesis, inasmuch as it harmonised many things which had formerly puzzled biologists. For many years it had never occurred to him to compare any parts of the arthropods with the functional corresponding parts in the vertebrata. As soon as Dr. Gaskell showed that there were strong reasons for believing that the central canal of the spinal cord corresponds with the primary intestinal canal, the difficulty considerably diminished, and many parts of the insect were found to correspond so closely to parts of the vertebrate, that it was no longer possible to ignore the correspondences between the structures, both in development and in relation to their anatomical parts. Having given a description of the insect brain, Professor Lowne referred to the idea that the antennæ of insects were homologues of the ventral appendages. The evidence against that idea was becoming stronger and stronger every day. They were not lateral appendages, in the usual sense—a fact long since recognised by Professor Balfour,—but olfactory organs, corresponding point by point, more especially in relation to the nerve ganglia, to the olfactory organs of the vertebrata. Neither did the eyes of the insect represent ventral appendages; they bore no relation whatever to them.

The lecturer entered at great length into the details of the structure and development of the arthropod brain, and showed that it possesses many points of similarity with the cephalic nerve centres of vertebrates; that it is developed from three vesicles; and that median pineal eyes are developed in the wall of the middle vesicle. That there is actually a third ventricle from which the nerve of the median eyes, ocelli, arises.

The lecturer finally dealt with the development of the eye. The sensory organs of arthropods were usually developed by the process of invagination of the epiblast, just in the same way as the sense capsules of vertebrates were developed. The eyes first appeared as a single layer of cells in a kind of cup-shaped cavity, divided into at least two layers; from the surface layer a series of lenses was developed about 4000 to 6000 in number, instead of one great lens. In some insects there were as many as 24,000 to 30,000 separate lenses. These form the compound cornea. The lenses were very remarkable in their structure, and appeared to consist of a stroma very much like the stroma of the red blood-corpuscle of a vertebrate, and a substance which has a very highly refractive power, and which is fluid and soluble in ether. This substance gradually passes out through the stroma after the insect dies, and impregnates the other tissues, but in a living insect the cornea has the same kind of brilliancy as in the vertebrate; but as soon as the insect dies the brilliancy rapidly fades, and in a quarter of an hour it has become quite dull.

The stroma consists of proteid substances, but as development progresses the albuminous material gives place to this highly refractive, probably oily material, and then the lenticular portion of the cornea becomes reticular after having been treated with such reagents as will dissolve out this interfibrillar substance. About twelve years ago, when examining the lateral portions of the compound eye of the lobster, he continually found thickenings beneath the rod-like bodies which united the corneal portion of the eye with the nerve centres beneath, and he became convinced that no nerve structure passed through this membrane, and then it struck him that, in trying to make out that this structure was retinal, he was doing very much the same thing as examining the minute structure of the crystalline lens of the vertebrata, and coming to the conclusion that the rod-like fibres of that lens were in themselves not merely a portion of the refractive structure, but were actually the terminals of the optic nerve. He regards the whole of the structure developed from the superficial epiblast as a refracting organ, and with that view he had termed it the dioptron, or the refractive portion of the compound eye. In some insects which do not undergo metamorphosis the great compound eye is at first small, and consists only of a few facets, but a new portion of the eye is developed at each shedding of the integument. The nerve also gradually passes to the surface, encircles the old nerve, and forms a new retina. This goes on until at the last the optic nerve is found very much spread out. During the last shedding of the skin the whole of the retina undergoes degeneration, and a new one takes its place; so that new sets of facets are developed at each skin shedding, and a new retina is developed from the nerve centres beneath the dioptron.

In expounding the various theories of insect vision, the lecturer explained that Müller's theory of "mosaic vision" was not in itself tenable, because, in the first place, the images produced would be blurred, and surfaces of eight or ten inches square, would only be visible as points at very moderate distances—say, ten or twenty feet. The theory which the lecturer propounded was that an inverted sub-corneal image was formed beneath each corneal facet, and the great rods of the dioptron produced a magnified erect image of that portion of the sub-corneal image which lies in the axis of each. The integration of these images produces the retinal image upon what he had described as the "neuron." This image had actually been demonstrated by Sigismund Exner of Vienna, who first showed it at the Cologne Congress of Naturalists. The "mosaic view," or Müller's theory announced about 1826, assumed that the tubes of the dioptron only permitted axial light to pass through them; so that each tube of the dioptron produces one distinct stimulation of the nerve, and there could only be as many separate sensations of light as there are tubes to the dioptron, a supposition which is quite incapable of explaining vision in an insect which has perhaps only fifteen or twenty lenticles of the eye, some only having five or six, although others have as many as 24,000 to 30,000. Even in those which have the largest number, the acuity of vision is not sufficiently explained by Müller's theory.

OUR LANE.

[*Continued from p.* 88.]

THE upper reaches of our lane are much frequented by that lovely and docile bird the goldfinch (*Carduelis elegans*), for here the thistle-heads afford him many a dainty meal; his head-quarters are, however, in my garden hedge, where, secure from harm, he builds, and delights us with his soft and cheerful strain. As sweet, though less varied, is the song of the beautiful plumaged chaffinch (*Fringilla cœlebs*), he, too, is a frequenter of our lane, and throughout the early spring and summer months pours out the gladness of his little heart from daybreak till night casts her dark mantle on all around. Nor must I forget my sober-coated *protégé*—most innocent of all the feathered tribe—the hedge-warbler (*Accentor modularis*). Use him very gently, dear reader, he is a most lovable bird; soft and low, his plaintive song correctly indicates his innocent nature. Drop for him the tiny crumb. I love his presence, and glad am I to think he is influenced by no migratory impulse. Need it be said that that harmless bird whose trustful nature leads him to seek man's companionship—his little, bright-eyed friend, sweet robin red-breast (*Erythaca rubecula*) attends us in our garden-strolls, and claims his daily share of crumbs; carolling his bright song by way of thanks. To him, as it is to others, our garden is a sanctuary, and well he seems to love it. The yellow-ammer (*Emberiza citrinella*), too, he loves the hedges and pastures of our lane; but he, too, in our garden hedges and ivy builds, nor do his oft-repeated notes pall on my ear. His favourite perch is the vane of a weather-cock upon the top of my summer-house, from whence, hour after hour, he trills his little varied song; this, too, when the songs of other birds have long been hushed. I always welcome the advent of that tiny bird the chiff-chaff (*Sylvia hippolais*), together with that of the whitethroat (*Curruca cinerea*). Not much have they to boast of in the way of song, but their sweet accompaniment to the richer melodies of other feathered choristers make up the sum of a glorious concert; whilst high above the much-besoiled earth, the skylark (*Alauda arvensis*) and the woodlark (*A. arborea*) pour out at "Heaven's gate" their joyous hymns of praise.

Adjoining my garden is an arable field, and beyond, and yet beyond are others, and here the former loves to nest, and through the live-long day sings in the cloudless, or sparsely-clouded sky. Well hath a writer designated song the joy of birds—a happy definition, for surely 'tis the expression of their happiness.

But linger I must not o'er a subject so fraught with pleasant associations, and scarcely dare I venture to enumerate birds so common in our lane, and skirting fields and orchards as the linnet (*Linota cannabina*), wren (*Troglodytes Europæus*), willow-wren (*Sylvia trochilus*), pied wag-tail (*Motacilla Yarrellii*), greenfinch (*Coccothraustes chloris*), bullfinch (*Pyrrhula vulgaris*), spotted fly-catcher (*Muscicapa grisola*), redstart (*Phœnicura ruticilla*), grasshopper warbler (*Salicaria locustella*), and such well-known birds as the siskin, wood-pigeon, ringdove, starling, meadow pipit, cuckoo, the ubiquitous sparrow, swallow, martin, and swift. Those restless and beautiful-plumaged birds the greater and the blue titmice swarm in my garden, and put my friendship to a severe test when my peas and pears are in season; whilst the cole titmouse (*Parus ater*) ever finds a welcome. Not seldom the screech-owl pours out his doleful plaint from trees hard by,* and the jay (*Garrulus glandarius*) visits my windows to gather the berries of the cotoneaster. The nuthatch (*Sitta Europæa*), too, is one of our most familiar birds, and his frequent tap, tap, tap, assures us of his presence even when his cry of "chu-whit" cannot be heard. Magpies, rooks and hawks are very numerous—a pair of the former nest in the ivy-clothed branches of a sycamore in my orchard-hedge, hard by the house.

A host of rarer visitants must needs be unmentioned. Enough has been told to inform the naturalist that the avifauna of our lane is not a limited one. Nor is animal life restricted to two-footed things. The nimble rabbit, scared by my footstep may oft be seen scampering up the lane—the agile squirrel ventures to leave his woods in search of hazel-nuts—and the freshly-raised hillocks of loam in the pastures, plainly indicate the presence of a silent worker—the sleek-coated mole (*Talpæ Europæus*). Those much persecuted creatures, the hedgehogs, abound in the meadows; and into our orchard, the past summer, I have good reason to believe, ventured a badger, or badgers, courageous enough to face an armed host of wasps; excavating large cavities, and tearing to fragments the nests—presumably to devour the grubs. No smaller animal could have excavated so large a quantity of earth in a single night. I have not, however, seen one, but learn that a sporting friend has several skins of these animals, all of which he has shot in this neighbourhood. The long-tailed field-mouse (*Mus Sylvaticus*), the short-tailed field-mouse (*Arvicola arvensis*), and shrews are wonderfully numerous—and that tiniest of four-footed creatures the elegant harvest mouse (*Micromys minutus*), is common in the fields adjoining my garden. A mere atom of four-footed animality is it, and a stranger to fear, for on the several occasions that I have come

Fig. 71.—The Jay (*Garrulus glandarius*).

* Her nest is in a yew tree some few yards from the bottom of my garden.

across them they have made no effort to escape from my open hand—even when placed upon the earth have made no haste to seek cover. The pretty dormouse (*Muscardinus avellanarius*) finds many a snug retreat in the woods hereabout, and of course

Fig. 72.—Nuthatch (*Sitta Europæa*).

the domestic mouse (*Mus muscules*) abounds. Our lane, too, can boast of more than its complement of toads, frogs, and slow-worms, and not long since we found a large adder that had been recently killed on the sunny open at the top of the lane *—whilst the grass-snake is common.

(*To be continued.*)

THE VOICES OF ANIMALS.

MR. J. G. HODGSON, President of the Manchester Elocutionists' Society, recently gave an address on the above interesting subject. In the mammalia the general structure of the larynx was like that of man; the power and character of the sound depending on the different degrees of development of the vocal cords, and the peculiarity of structure of the vocal organs. All animals had their characteristic voices and calls, in more or less distinct intervals and varied degrees of compass. The timbre or quality of voice was remarkably distinct in the different classes of animals, so that a mistake could not well be made. It also varied in those of the same class; the lamb could distinguish the call of its dam by the timbre of her bleat from that of the rest of the flock. Here the president showed the larynx of a sheep which he had dissected the day before. He explained the cartilages, epiglottis, and vocal cords, and noted that in this instance these cords did not meet the whole of their length, for there was an elliptical orifice in the centre. Lions and tigers with their magnitude of chest made a roar that filled the human ear with a sense of horror, as no doubt it did the ear of their prey. The depth of voice gave to the mind the idea of an enormous being which made children try to frighten each other with imitating the sound. The horse neighed in a descent on the chromatic scale without even omitting a semitone. It was one of the most musically-voiced of mammals; and the imitation was very difficult. The ass brayed in a perfect octave, beginning with a modest whistle, and, as the poet said, "sings in sonorous octaves loud and clear." Haydn had copied one of its ejaculations in his seventy-sixth quartette with great success. The bark of a dog was an instance of an acquired voice by domestication, much in the same way as the trotting of the horse was an acquired movement. In a state of nature the dog whined, howled, or growled. Columbus found that the dogs he had previously carried to America had lost their bark. As with many animals, the dog was capable of showing difference of feeling—the shepherd's dog gave the sound of command to the flock, while a horse knew from the bark whether the dog would bite his heels or not. Humboldt said the howling or preacher monkey of South America could be heard two miles, which was due to certain pouches connected with the larynx and to a drum-like development of the hyoid bone. An ape, one of the Gibbons, produced an exact octave of musical sounds, ascending and descending the scale by half-tones, so that perhaps it alone of brute animals might be said to sing. In the elephant house at Belle Vue Gardens there were several small monkeys with pleasing singing voices. It seemed a pity that the meek-looking and beautifully marked giraffe, that reached in one case that he had seen a height of $17\frac{1}{2}$ feet, should be voiceless, yet it and the armadillo had no vocal cords. The chirp of the long-eared bat was said to be the most acute sound produced by any animal. Only five out of six people could hear it. In reptiles the larynx was in a rudimentary condition, and the vocal organs showed considerable divergence. The

* These snakes are particularly abundant in certain unfrequented spots.

crocodiles and caymen made a feeble roaring sound. One kind of frog had a sound bag at each side of its mouth that acted as a resonance chamber. This must have been the case with an African frog he had heard at the distance of about 100 yards. It made a noise like a loud barking. The tortoise gave a mere snuffling sound. Snakes had no vocal cords; they only produced a hissing sound by driving air through the narrow opening of the glottis. Most fishes were mute, yet it was said the mackerel was an exception, for when taken out of the water it made a moaning sound, caused by the friction of the bones of the larynx. Insects, such as crickets, grass-hoppers, and bees, were considered by the French naturalist, Goureau, to be more musicians than singers. Most of their sounds were caused by the friction of their wings together, or their legs against their bodies, or by the rapid vibrations of their wings in flying; and in bees and wasps the sound might be increased by the air passing rapidly through the thoracic air holes. Dr. Carpenter said that "in Brazil there was a grasshopper that could be heard at the distance of half a mile, which was as if a man with a big voice could be heard all over the world."

NOTES ON NEW BOOKS.

AN INTRODUCTION TO THE STUDY OF BOTANY, by E. Aveling (London: Swan Sonneschein & Co.). Although students of plants need not fear for lack of good manuals, there was some room for such a work as Dr. Aveling has produced. It is laid on new and original lines of treatment, and is a capital introduction to the study both of plants and plant-life. Dr. Aveling here proves himself a thorough teacher—a rôle which requires something more than mere technical knowledge, however full and thorough. His style and manner of treatment of his subject are as simple as it is possible to be. The illustrations are numerous, and mostly original. We cordially recommend Dr. Aveling's manual to all those who are anxious to familiarise themselves with the fascinating science of Botany.

Botany, A concise Manual for Students of Medicine and Science, by Alex. Johnstone (Edinburgh and London: Young I. Pentland). This is another new work on the same subject, treated, however, in a somewhat different manner—that is, in the shape of concise notes and summaries of the chief subjects of botanical science. Mr. Johnstone's book is a kind of "illustrated digest," and is therefore very useful for reference or memoriter suggestions. It contains one hundred and sixty-four illustrations, besides a numerous series of floral designs. Students will find Mr. Johnstone's little work of great use to them.

The Medical Annual, 1891 (Bristol: John Wright). The present is the ninth issue of this increasingly useful book. It includes among its contributors the best medical writers of the day. The articles deal with the latest discoveries and subjects relating to every department of surgery and medical science. This year's Annual contains thirty-six original papers, on as many subjects, by various authors. There is also a medical, hospital, and asylum directory, and a large miscellany of information useful to medical men.

The Fishes of North America (New York: Westermann & Co.). We have received the first part of this work, dealing only with fishes "caught on hook and line." The two full-sized coloured plates are fine examples of oleographic art. The wood engravings, letterpress, and paper are superior, and altogether this work (which is to consist of forty parts) will be about the finest yet published on the subject. The two coloured plates represent the red-spotted Mascalonge (*Lucius masquinongy*), and the Rocky Mountain Trout (*Salmo mykiss*). We will duly apprise our readers of the further issues of the parts of this magnificent work.

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. Brunetti.

[*Continued from p.* 55.]

BRACHYCERA.

THE *Brachycera* are more stoutly built than the *Nemocera*; the legs are shorter and thicker; the antennæ apparently of only three joints, never flexible (except in *Xylophagidæ*); the veins in the wing are less numerous and more reducible than those in the *Nematocera* to a type form; the alulæ are large; the palpi one or two jointed; the anal cell in wing closed.

The larvæ are aquatic or terrestrial, some feeding on animal matter, some on vegetable, principally when either is in a decaying state; a few species are parasitic. The flies inhabit almost every nature of habitat, and live on the juices of animals or plants.

Mr. Pasco (1880) recognises the *Tabanidæ* as the most highly developed family, in having nearly all the parts of a mandibulate mouth, placing the *Œstridæ*, in which that organ is more or less obsolete, as the lowest.

Macquart's *Brachycera* (agreeing with mine) is divided into three divisions (on the number of pieces composing the haustellum), named respectively *Hexachætæ* (*Tabanidæ* only—the haustellum composed of six pieces); *Tetrachætæ* (the majority of the remaining families—haustellum of four pieces); and *Dichætæ* (*Louchopteridæ* to *Phoridæ*, and the *Syrphidæ*—haustellum of two pieces).

In the short analytical tables of genera under each family, it is of course understood that only the principal ones are given.

1. Third antennal joint ringed, style or bristle, when present, always terminal; third longitudinal vein always forked.

2. Costal vein diminishing and not attaining tip of wing; scutellum generally spined: *Stratiomyidæ.*
2.2. Costal vein extended round tip of wing in nearly uniform width; scutellum rarely spined.
3. Alulæ large and distinct: *Tabanidæ.*
3.3. Alulæ very small: *Xylophagidæ.*
1.1. Third antennal joint unringed; style or bristle, when present, dorsal or terminal; third longitudinal vein forked or simple.
4. Antennal style or bristle absent, or, when present, always terminal.
5. Alulæ very large: *Cyrtidæ.*
5.5. Alulæ moderately large or small.
6. Front and crown deeply indented; eyes very prominent: *Asilidæ.*
6.6. Front and crown smooth, often elevated; eyes not prominent.
7. Third longitudinal vein forked.
8. From the discoidal cell, or from this and the posterior basal cell together, at most three veins emerge and reach the border; therefore, never more than four posterior cells present.
9. Third antennal joint without style or bristle: *Scenopinidæ.*
9.9. Third antennal joint with a style or bristle.
10. Anal cell always attaining the border, and there, either open or closed: *Bombylidæ.*
10.10. Anal cell never attaining the border, generally short and closed: *Empidæ* (part).
8.8. From the discoidal cell, or from this and the posterior basal cell together, at least four veins emerge and reach the border; therefore, at least five posterior cells present.
11. Three onychia to tarsus: third antennal joint with terminal bristle: *Leptidæ.*
11.11. Two onychia only; third antennal joint with terminal style: *Therevidæ.*
7.7. Third longitudinal vein simple.
12. Wings lanceolate: *Lonchopteridæ.*
12.12. Wings always rounded at the tip.
13. Anal lobe of wing distinct.
14. Antennæ with terminal bristle: *Platypezidæ.*
14.14. Antennæ with terminal style (*Conopinæ*): *Conopidæ* (part).
13.13. Anal lobe of wing rudimentary or absent.
15. Anterior basal cell short; posterior united with discoidal cell: *Dolichopidæ* (part).
15.15. Anterior basal cell long, reaching middle of wing; posterior separated from discoidal by a transverse vein: *Empidæ* (part).
4.4. Antennal style or bristle always present and always terminal.
16. Anal cell long.
17. Proboscis horny, long, simple, or geniculated (*Myopinæ*): *Conopidæ* (part).
17.17. Proboscis soft.
18. A spurious vein generally present, running along the third longitudinal vein; eyes moderately large: *Syrphidæ.*
18.18. Spurious vein absent; eyes very large: *Pipunculidæ.*
16.16. Anal cell short.
19. Posterior basal cell united to the discoidal: *Dolichopidæ* (part).
19.19. Posterior basal cell separated from discoidal by a transverse vein.
20. Proboscis and palpi always distinctly present: *Muscidæ.*
20.20. Proboscis rudimentary; palpi rudimentary or absent: *Œstridæ.*

12. *Stratiomyidæ.*

In the "Ent. Month. Mag." for April, 1889, I gave a list of the British species of this family, with analytical tables of genera and species.

The venation of all the twelve genera is very similar, and easily recognised.

The flies chiefly inhabit damp grass, marshes, aquatic plants, and more or less humid localities, the larvæ feeding on rotten fungi and decaying vegetable matter.

The life-histories of some of the commoner species have been fully worked out.

There are five sub-families, divided as follows:—

Abdomen of five or six segments; scutellum two-spined or bare.
Discoidal cell emitting three veins: *Pachygastrinæ.*
Discoidal cell (or together with posterior basal cell) emitting four veins.
Species never metallic in colour; always black or green, with yellow spots or bands.
Scutellum spined (except *Nemotelus*).
Antennal style thin, long: *Clitellarinæ.*
Antennal style short, blunted: *Stratiomyinæ.*
Species always metallic; Scutellum unspined: *Sarginæ.*
Abdomen of seven segments or more; scutellum two, four, or six-spined: *Berinæ.*

The *Clitellarinæ* are represented by *Ephippium*, Latr., and *Oxycera*, Mg.; the *Stratromyinæ* by *Stratiomyia*, Geoff., *Odontomyia*, Mg., and *Nemotelus*, Geoff.

Pachygastrinæ.—Pachygaster, Mg., three species: none very common. *P. ater*, Pz., is easily identified by the blackish basal half of the wing, whilst in *P. Leachii*, Curt., it is nearly all whitish; long 3 mm.

Clitellarinæ.—Ephippium thoracicum, Latr., is a large black fly, with long brownish-black wings, thick red pubescence on the dorsum, and a strong large spine on each side of the thorax; very rare; Coombe Wood. It is supposed to take two years to reach maturity; long 12 mm.

Oxycera, Mg., is a genus of rather small black flies, with bright yellow spots and bands at the sides and tip of the abdomen, the first segment of which is much contracted.

They occur in the height of summer in long grass. and are most frequently met with in Dorsetshire; long 3–5 mm.

Stratiomyinæ.—Large flat-bodied flies, bred in stagnant water, and usually found in its proximity. Abdomen black, marked with large yellow side spots (*Stratiomyia*, Geoff.), or yellowish, with an angular dorsal stripe (*Odontomyia*, Mg.); *S. furcata*, F. (long 11–13 mm.), and *O. viridula*, F. (long 6–8 mm.), being the most common species.

Sarginæ.—Brilliant metallic-coloured flies, tolerably common. *S. cuprarius*, L., is blackish, thorax and abdomen metallic blue or green, or exhibiting both colours; wings with a brown suffusion below the stigma; legs thin, black; long 7–9 mm.

Microchrysa polita, L., is a small bright metallic-green fly, with clear wings and black legs; common; often occurring in London; long 4 mm.

Berinæ.—Beris, Mg. They are smaller than *Odontomyia*; in two species the abdomen is reddish yellow, in the other three, blue-black; occurs chiefly in woods.

13. *Xylophagidæ.*

Two genera are British (five species), all very rare. Their flight is sluggish; the larva are wood feeders, and if more frequently searched for, the species might possibly be bred. Zetterstedt bred more than one species, I believe, in Scandinavia.

The antennæ are attenuated, and somewhat approach those of the *Nemocera* in appearance, Walker thinking the group a link between the two great divisions *Nemocera* and *Brachycera.*

Antennæ ten-jointed: *Xylophagus*, Mg.
Antennæ twelve-jointed: *Xylomyia*, Rond.

Xylophagus ater, F., is illustrated in Walker's "Diptera," i. Pl. i., Fig. 10.

14. *Tabanidæ.*

These flies are the largest British diptera, about twenty species being indigenous; popularly known as gad-flies. The old Roman and Greek writers allude to flies which were evidently species of this group.

The ♀ attack cattle, and alighting on the back of the animal, draw blood by means of the long, powerful proboscis. The male is comparatively harmless, and feeds on the juices of flowers. They pair in the air, and frequent woods and pastures, their abundance often making certain roads impassable, as some species readily attack man. The Rev. J. G. Wood recommends smearing the face,

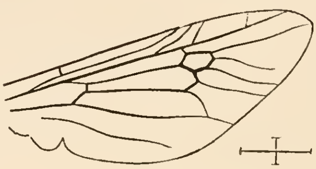

Fig. 73.—*Stratiomyia*, Geoff.

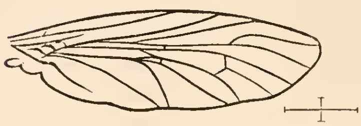

Fig. 74.—*Dioctria*, Mg.

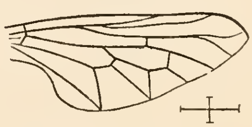

Fig. 75.—*Thereva*, Latr.

neck, and hands with paraffin as a preventive against their attacks.

Their flight is very rapid, with a loud hum, and they occur most abundantly in the New Forest.

Two sub-families are recognised, the venation being the same in both.

No ocelli; posterior tibiæ unarmed (*Tabaninæ*).
    Antennæ seven-jointed.
        Eyes bare: *Tabanus*, L.
        Eyes pubescent.
            Ocellar tubercle on vertex: *Therioplectes*, Zell.
            No ocellar tubercle: *Atylotus*, Os. Sac.
    Antennæ six-jointed: *Hæmatopota*, Mg.
Ocelli present, three (*Pangoninæ*).
Posterior tibiæ with small spine at the tip: *Chrysops*, Mg.

Tabaninæ.—Hæmatopota pluvialis, L., is a greyish-black fly marked with lighter bands; the wings are mottled grey, with light curved lines and circles; long 8 mm.; often very troublesome to pedestrians.

Tabanus sudeticus, Zell. This species, the largest British fly, is usually mistaken for *T. bovinus*, L. (a much less common species in Britain). It is of a tawny brown colour, the abdomen being marked with darker bands; the wings are pale grey with tawny veins; legs tawny with black tarsi tips; long 20 mm.

T. bromius, L., a smaller species of a grey colour, with pale grey wings and blackish-grey legs, is also common; long 13 mm.

Pangoninæ.—Chrysops, Mg., is a black and yellow fly, with light wings, marked deeply with brown in the ♂, those of the ♀ being almost entirely brown; the sexes also differing in the form of the abdominal markings; long 9 mm.; chiefly from the south coast.

Brauer in 1880 published a splendid monograph of the European species of *Tabanus*, his chief specific characteristics being the number, size, and direction of the bands on the eyes (coloured during life), the shape of the antennæ, and general form of the frontal stripe.

15. *Leptidæ.*

Six genera and about twenty species are British, though several others have been wrongly introduced as such. Long-bodied, large-winged, long-legged

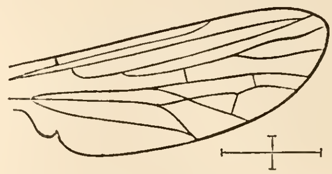

Fig. 76.—*Asilus*, L.

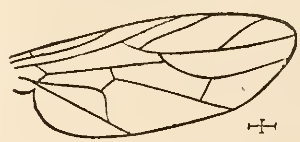

Fig. 77.—*Scenopinus*, Latr.

flies of delicate structure, found in woods and shady localities, the larva living in decaying wood or in the earth.

Some species inhabit marshes and ditches. The metamorphoses of several species are known, Degeer saying they take three years to reach maturity. De Romand states that the larva has been known to fast for six months.

The venation of all the genera is similar, but the structure of the antennæ varies.

The three principal genera are thus separated:—

Anal cell open: *Leptis*, F.
Anal cell closed.
    Wings uniformly clear: *Chrysopila*, Meq.
    Wings spotted with brown: *Atherix*, Mg.

Leptis tringaria, L., is a large, tawny, long-bodied fly, with long, tawny legs, and wings tinged with tawny brown; abdomen tawny, with a dorsal row of black spots; long 9–10 mm.

L. scolopacea, L., an allied species, differs in having wings marked extensively with brown; both common.

Chrysopila auratus, F., and *aureus*, Mg., are black flies, smaller than *Leptis*, with clear wings and dark brown stigma; common; long 7 mm.

Atherix Ibis, F., is a rare species, occasionally found in swarms, the ♀♀ clinging to one another at the end of a branch, depositing their eggs, and dying immediately afterwards; the mass gradually enlarging as fresh flies settle on it, and assuming a pear shape.

L. scolopacea, L., Wlk. i. Pl. ii. 6. *L. notata*, Mg., Curt. 705, (*Heyschami*). *C. aureus*, Mg., Curt. 713. *A. Ibis*, F., Curt. 26.

16. *Asilidæ.*

These flies are large, powerful, carnivorous insects, especially the ♀, forming an extensive, natural

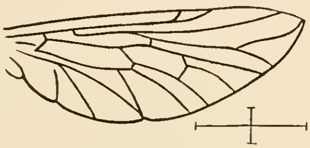

Fig. 78.—*Tabanus*, L.

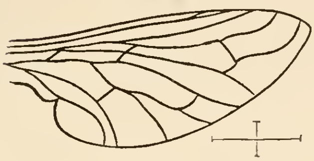

Fig. 79.—*Bombylius*, L.

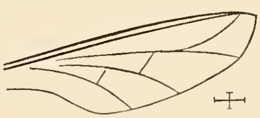

Fig. 80.—*Pacrocera*, Mik.

group, being very abundant in warm countries, the species there attaining very large size.

R. Desvoidy saw a species of *Dasypogon* with an *Apis* in its mouth.

Flight powerful, accompanied by a loud hum. They frequent woods, pastures, and dry, sandy situations, the larvæ living on plant roots.

The metamorphoses of most species are unknown. The venation is distinct.

Westwood figures larva and pupa of *Asilus crabroniformis*, L., in his Class. "Ins.," Vol. ii., Fig. 129.

Four sub-families, and 14 genera, representing about 20 species, are British.

Marginal cell open.
  No onychia to tarsi: *Leptogastrinæ.*
  Onychia present: *Dasypogoninæ.*
Marginal cell closed.
  Third antennal joint non stylate: *Laphrinæ.*
  Third antennal joint stylate: *Asilinæ.*

Leptogastrinæ.—Leptogaster cylindrica, Deg. Easily recognised by its extremely attenuated abdomen, the short wings, and absence of onychia; long 9–10 mm.

Dasypogoninæ.—Dioctria rufipes, Deg., is a more stoutly-built black fly, and with pale grey wings, the two anterior pairs of legs being reddish; long 11 mm. The six British species of *Dioctria* are easily recognised, and appear to be most common in Sussex.

Laphrinæ.—Two species British; both uncommon, (I have taken L. marginata on nut in Kent.)

Asilinæ.—Asilus crabroniformis, L., is a large, pubescent, tawny-brown fly, with the apical half of

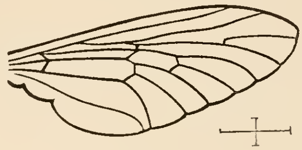

Fig. 81.—*Leptis*, F.

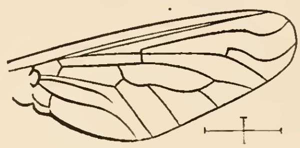

Fig. 82.—*Anthrax*, Scop.

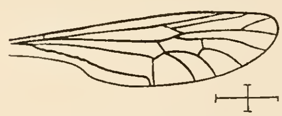

Fig. 83.—*Xylophagus*, Mg.

the abdomen yellow; tawny-brown legs, spiny and hairy; yellow wings with brown border. Its flight is peculiar, settling on the ground every few yards. Linné says it attacks cattle; long 18–20 mm. *Dysmachus trigonus*, Mg., a smaller, greyish species, pubescent and spiny, and *Machimus atricapillus*, Fln., an allied species, with the legs prettily marked with tawny rings, are both tolerably common.

A. crabroniformis, L., Wlk. i. Pl. ii. 2. *L. cylindrica*, Deg., Mg., Sys. Bes. iii. Pl. xii. 16 (tipuloides). *Laphria marginata*, L., Curt. 94. *Isopogon brevirostris*, Mg., Curt. 153. *Pamponerus germanicus*, L., Curt. 46.

(*To be continued.*)

PROFESSOR WEISMANN'S THEORY OF HEREDITY.

ABOUT a year ago I began the first of a series of papers on this subject, but was obliged to leave off owing to the pressure of other work. I had been struck by the fact that there had been only one or two casual references in the pages of SCIENCE-GOSSIP to a subject which was more than any other agitating the minds of the present generation of biologists, and it seemed to me that a sketch of the theory in question, and its bearings upon the problem of the factors of organic evolution might be of considerable interest to those of your readers who have not the time or inclination for a thorough study of the question. I hope now to be able to carry out my original scheme and contribute the papers alluded to.

My immediate object, however, in the present instance, is to enter a strong protest against the very unfair and misleading way in which the question has been now attacked in your pages (SCIENCE-GOSSIP for February, pp. 25-30).

Mrs. Alice Bodington sets out by deploring that Mr. Wallace has been " hardly, if at all, influenced by the discoveries of the last quarter of a century," and concludes by stigmatising the Neo-Darwinians as an " unprogressive school which arrogates to itself the right of claiming to be his (Darwin's) special disciples." Between these two startling statements we have a great deal of talk about "inherent" and "internal" forces, "initiating variation" or "rendering it possible," and about many other equally curious notions of the phenomena of heredity and variation. There is hardly a line of argument in the article, only a series of vague denunciations of the supposed one-sided views of the Neo-Darwinians, founded on a series of the most astounding misconceptions of what those views are, and of the real questions at issue.

It hardly appears worth while to go through the paper pointing out these misconceptions in detail, but it may be as well to notice a few. Mrs. Bodington says "we are gravely asked to believe that all these modifications are the result of a series of accidents occurring generation after generation with results more and more marked, yet all uninherited and accidental!" What does this mean? Nobody in his senses ever asked anyone to believe such an astounding travesty of the theory of natural selection.

Surely, it is at this period of time unnecessary to point out that the word "accidental" applied to congenital variations, merely means that the original occurrence of any particular variation has no reference to the purpose which it serves, and which enables it to be fixed by natural selection. Again the inheritance of such variations is an experimentally established fact—a fact, moreover, on which the whole theory of natural selection rests. What we do deny is the inheritance of a character acquired during the lifetime of the individual. Mrs. Bodington has entirely lost sight of the distinction between these two kinds of characters, which is the whole point of our position, with the absurd result that she talks about being asked to believe that "accidental" (congenital) variations are "uninherited," and about "prepossessions against heredity!"

Again, no one in his senses stated the "Law of the action of the environment upon irritable Protoplasm" to be "non-existent." All that is contended is that the effects of such action are not, among the metazoa, transmitted, as such, to the offspring.

Professor Weismann does not consider that he has proved his theory of heredity and variation at all, in his laboratory or elsewhere, nor did the wildest enthusiast ever contend that laboratory work will "explain everything." That his theory is "contradicted by the evidence of palæontologists" is impossible, since it is impossible that palæontological evidence can touch such a theory.

Mrs. Bodington apparently refuses to believe in "a predisposition to point on the part of a germ," yet it is sufficiently obvious that such a predisposition must exist in the germ, however it has got there, or else how is this character transmitted from parent to offspring?

Mrs. Bodington says of Professor Weismann's statement that "the inheritance of acquired characters has never been proved either by means of direct observation, or by experiment," that "such an assertion takes one's breath away;" but she carefully refrains from stating a single instance in which such inheritance has been proved. It is no answer to inform us that Darwin believed in such inheritance, that his belief increased somewhat in later years, that Mr. Herbert Spencer believes this form of inheritance to have been still more important. We know these things, but we are still waiting for proof of such inheritance—proof such as we have in abundance as to the inheritance of congenital variations.

As to the right of those who deny that we can accept the inheritance of acquired characters as a factor in evolution to claim that they are advocating pure Darwinism, we can only say that they are laying still more stress on the factor which Darwin first pointed out, which he always believed to be far the most important one, and which is for ever connected with his name.

A. G. TANSLEY.

Trinity College, Cambridge.

THE BIRDS OF FORT AUGUSTUS.

By MERVYN WOLSELEY.

THE neighbourhood of Fort Augustus is well adapted for birds of every kind, from the great golden eagle to the tiny jenny wren.

The silent, rocky glens and steep mountain sides form perfect fortresses for the golden eagle and lordly peregrine. The woods and plantations afford a safe resting-place for the smaller birds; while the heather-covered moors abound in grouse and blackcock. Flocks of pigeons dwell among the wooded glens, and the swamps and marshes are filled with every variety of wader. The lakes and rivers, teeming as they are with fish, invite to their rippling surface crowds of hungry water-birds. It would be safe to assert that we have quite a hundred and thirty different kinds of birds, which stay with or visit us during the course of the year.

The golden eagle can sometimes be seen, either hovering over some doomed hare, or circling round and round on the look out for a victim, to satisfy its appetite. A pair of these birds build every year on a tree near Invermoriston; but they are strictly preserved, or their eggs would soon fall into the hands of some naturalist. But these birds can only be seen among the hills, as they seldom venture near the more cultivated ground in the valleys. The bold peregrine is the largest of our falcons. I once saw a very interesting battle between a couple of these warriors and a golden eagle. It lasted for upwards of an hour, but, unfortunately, I was not able to see the end of the battle, as the combatants went over the neighbouring mountains. There are three nesting places of this bird known—one of them not more than a mile from the village of Fort Augustus. A pair of merlins used to live here, but they have recently been shot by some keeper. Sparrow-hawks and kestrels are also seen—the latter in great abundance, for there are no less than ten nests in the neighbourhood of the village. The pretty osprey, or fishing hawk, is among our many visitors in the spring. It formerly laid its eggs along the side of Loch Ness, on a tree jutting over a precipice, but even in this secure position its eggs were taken, so it was obliged to shift its quarters, and it is not known for certain where it builds at present.

Finches, buntings and other species of little birds are fairly numerous, chaffinches and yellow-hammers being about the commonest. The pretty little siskin has been shot here more than once, but it is considered a very rare bird. A great grey shrike was shot by one of the boys of our college in the act of eating a redpole. The nest and eggs of a red-backed shrike were found some years ago. We have very few birds belonging to the swallow family. The sand martin, certainly, cannot be called rare, but both the swallow and the house martin are very scarce. Swifts are also decidedly rare. House martins and swallows used frequently to be met with, building in great numbers under the eaves of the college tower, but of late they have quite deserted us. I have only seen one nightjar, and have not heard of the nest or eggs having been discovered. Cross-bills come over in large flocks, during the month of July, and a few pairs are often seen about April or May, but they are usually shot down and not given a chance to breed. Thrushes, ring-ousels, dippers, wheat-ears, and others of this family are in great numbers during the spring and summer. The plantations are inhabited by flocks of tits and golden-crested wrens.

The Corvidæ family are exceedingly numerous, especially the little jackdaw, which builds in the rabbit holes on a precipitous cliff, surmounted by an ancient vitrified fort. Hooded crows are by no means rare: they live along the birch-covered hills, and a keeper once told me that he destroyed about forty nests belonging to this bird, during one season, in his own district. Rooks and crows are not so numerous as in other places. The bold raven, however, is a resident in the district. There are three nesting places, but they are all among the hills, as this bird is very shy and likes to make its home as far as possible from the haunts of men.

There are three different kinds of grouse here, namely the red and black grouse and the ptarmigan. The two first live on the extensive moors on the mountain sides, while the last can only be found on the tops of the highest hills. Corriearrick, on the road to Kingussie, about ten miles off, is the best place to see them, and their eggs have been discovered there. They can only be visited in the summer, as the place is inaccessible in winter, on account of the snow, so the birds are not seen in the best of their plumage.

The only kind of pigeon we possess is the wood pigeon, or ring-dove. These are found in countless numbers among the wooded glens, and thence they come in flocks to the cornfields, from which each carries away its cropful of corn.

The waders are most numerous in the seasons of spring and summer. During the month of March, our swamps are filled with plovers, snipe, and curlews, splashing about in the shallow waters and pushing their long beaks into the soft mud in search of food. Thence they make their way to their respective nesting places. The plovers select the marshy spots among the hills; the snipe fly to the rushes, which fringe the edges of the neighbouring lakes; while the curlews live on the open moors, whence their shrill whistle may constantly be heard. A very fair heronry exists on one of the islands in Loch Knockie, about eight miles from Fort Augustus. The large nests can be seen nearly half a mile off. While you are on the island, the herons fly distractedly overhead, supported on their mighty wings and looking rather awkward with their long necks and legs. The golden plover, and the red and greenshanks can be seen only on the high lakes, among the mountains, where they breed. Sandpipers are most plentiful along the banks of the lakes and rivers. The handsome sea-pie, or oyster-catcher, arrives here, with its other companions, in the spring. There is only one place where it is known to breed, and that is about a mile and a half up the canal, near Cullochy Locks. The pretty moor-hen, with its red and yellow beak and long green legs, stays with us the whole year round, sometimes having the swamps all to itself.

The water-birds are fairly numerous, owing to the quantity of rivers and lakes in the district. The black-throated diver is one of the largest of these.

It is known to lay on the islands in Loch Lundi and Loch Nan Criche. The pair at Loch Lundi, however, have been conjectured to be great northern divers, but as they are very shy birds, it is almost impossible to obtain a good look at them. The eggs found there were certainly much larger than those of a black-throated diver. Red-throated divers are much more plentiful; their nearest nesting-places are Loch Tarff and Loch Knockie. One was shot not long ago by one of our boys, a short distance from the entrance of the Caledonian Canal. Cormorants are in fair quantities; nearly every day one or two can be seen flying overhead to their feeding-grounds. A pair is supposed to build on the shores of Loch Ness, but no one has yet found the nest. Six kinds of ducks either breed or visit us during the summer, namely, the mallard, widgeon, golden-eye, tufted duck, shieldrake, and teal. Mallards are very plentiful; I have seen upwards of three hundred rise together in some of the bays down the lake. The tufted duck, widgeon, and shieldrake are rare, and only seen occasionally. A few pairs of golden-eyes inhabit the lakes, and the teal is nearly as common as the mallard. The greylag goose is occasionally encountered, and is supposed to build at Loch Nan Ean, near Invermoriston. Gulls of all kinds build on any of the lakes possessing islands. The common gull is the most plentiful, and lays on Lochs Tarff, Lundi and Nan Criche. Black-headed gulls, on the other hand, are restricted to Loch Lundi, where they keep a little corner to themselves. A pair of lesser black-backed gulls breed on Loch Nan Criche. Kitiwakes, greater black-backed gulls, and herring gulls are often seen, but they, however, prefer the west coast to lay their eggs.

The above enumeration, which is by no means exhaustive, will give some idea of the number and variety of birds which frequent our neighbourhood. The cause of this is, doubtless, to be found in the diversified nature of the country, which is thus admirably adapted to afford sustenance to our feathered friends, and enable them to supply their widely different needs.

The Abbey School, Fort Augustus, N.B.

THE GEOLOGICAL HISTORY OF THE THAMES VALLEY.

Abstract (by the author) of a Lecture delivered before the Windsor and Eton Scientific Society, on February 19th, 1891, by the Rev. A. Irving, D.Sc., Senior Science Master in Wellington College, Berks.

Introductory Remarks.

THE geological history of 'Father Thames' has a special and local interest for the millions of dwellers upon his banks. But to the geological student this interest is greatly magnified by the fact that of the larger modern river-valleys of Britain that of the Thames (in its wider sense) is certainly one of the most ancient. Its history from the geologic standpoint is almost co-extensive with Tertiary time and all that has followed since. We shall see, as we proceed, that the Upper or Oxford Basin is a comparatively recent addition to the line of the Thames drainage; the true geological history of the Thames is identified with the line of drainage marked approximately by the valley of the Kennet, and that of the Lower Thames (below Reading).* This must be regarded as the lower course (Unterlauf) of a great river whose middle course (Mittellauf) and head-waters (Sammelgebiet) were found in the great mountain-system which made the mountains of Scandinavia continuous with the once higher mountains of Brittany, the worn-down stumps of those appearing in the palæozoic and archæan rocks of the more mountainous portions of the north and west of Britain. [Reasons were given for considering this a more likely gathering-ground of the head-waters of the great Eocene river, than a hypothetical vast stretch of continental land to the west.]

The duplicate basin of the modern Thames consists of the Oxford Basin, draining chiefly Jurassic rocks; and the Lower or London Basin, in which we have only to do with the rocks of Cretaceous and Tertiary age, and with Quaternary and recent deposits. This latter basin, briefly sketched, lies in a synclinal valley of the Chalk, the chalk hills rising to 975 feet at Inkpen, the culminating point of the Kingsclere axis, and to 850 feet in the Downs of the White Horse range, no important transverse incision being made by rivers. The Kennet rises near the Chalk escarpment to the west at not more than 500 feet; the valley of this river being probably the truncated valley of the chief arterial line of drainage of Southern Eocene England. As the Chalk escarpment is cut through on the north-west, at the Pangbourne and Goring gorge, so the Chalk escarpment of the North Downs is cut through by tributary streams, which rise on or near the axis of the Weald. We pass by the question of the relative claims of the 'Seven Wells' or the 'Head of Isis' to represent the true source of the Thames,† not only because the Windrush or the Cherwell may, for length and volume of water, establish a better claim than any of the streams which rise near the escarpment of the Cotswolds above Cricklade, but much more because, from the point of view of geological history, no part of the present drainage of the Oxford Basin has any claim whatever. The Kennet-Thames line of drainage served as the channel of a much greater volume of water than in recent times, while the present area of the Oxford Basin was drained in other directions, mainly perhaps in the direction of the Ouse, towards the old North Sea.

The succession of the British rocks, the classifica-

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* See "Journal of the Geol. Soc.," vol. xliv., pp. 178, 179.

† See Professor Phillips, "Geology of Oxford and the Valley of the Thames," chap. iii.

tion of the Tertiaries established by Lyell, and the grounds of that classification were then briefly touched upon; and some reference was made to Prestwich's Geological Map of Europe, and to Professor Zittel's sketch-maps of the distribution of land and water in middle and western Europe in Cretaceous and Eocene times.*

It was thus briefly pointed out how the great Cretaceous sea was broken up into a number of detached areas of deposition, one such area being the Eocene Anglo-Gallic Basin, which included the south-east of England, the north of France, and Belgium; and the data, on which our knowledge of this is based, were briefly touched upon. In this basin were deposited the Lower London Tertiaries; the Thanet Beds (marine) to the east; and the Woolwich and Reading Beds, with marine shells in east Kent, with estuarine shells in West Kent and East Surrey, becoming unfossiliferous, except for an occasional flora (as at Reading), in Berks. The evidence which these facts furnish of the drainage in early Eocene time, having come from the west, was dwelt upon. The numerous outliers of the Woolwich and Reading Beds, and the wide distribution of the sarsens and conglomerates, which we can identify with them, upon the present dip-slopes of the two Chalk ranges, which bifurcate towards Norfolk and Dover respectively, and even beyond the present principal escarpment of the Chalk (as at Avebury), tell of the enormous extent of this ancient Eocene estuary, which Sir Andrew Ramsay has compared, in extent and importance, with the modern estuaries of the Ganges and of the Amazons.†

* "Aus der Urzeit" (Oldenbourg, Munich), Tafn. iii. and iv.
† "Phys. Geol, of Great Britain" (5th ed.), p. 247.

First Delimitation of the Tamisian Area.

The initiation of the movements which have taken place along the line of the Kingsclere-Hindhead axis was the first step towards the delimitation of the Eocene Tamisian area of drainage. This may have occurred in early Eocene time, since there seems to be no clear evidence to show that the London Clay and the Bagshot Beds of the London area were ever continuous with those of the Hampshire Basin, while the diminished thickness of the London Clay, where it lies against the flank of the great anticlinal, and underlies the Bagshot Beds* (as at Highclere), points to the end of the London Clay period as the forward limit (in time) for the movement referred to. On the other hand the maintenance of a pretty constant thickness by the Woolwich and Reading Beds and their lithological similarity in Berks and Hants, seem to tell us that no important movement along the axial line occurred during the period of their deposition. The small areal range of outliers of London Clay on the Chalk Hills of Oxfordshire, Bucks and Herts to the north, and of Hants, Berks, Surrey and Kent to the south, affords another indication of the diminution of the area of deposition of the London Clay as compared with that of the formations which preceded it.

As is often seen to be the case, these initial movements on the southern line of elevation, and probably movements on a Mercian line of elevation also, had their counterpart in a corresponding depression of the intermediate synclinal, which was gradually filled with the sedimentary deposits, whose accumulations have given us the London Clay.

* "Journal of the Geol. Soc.," *loc. supra cit.*

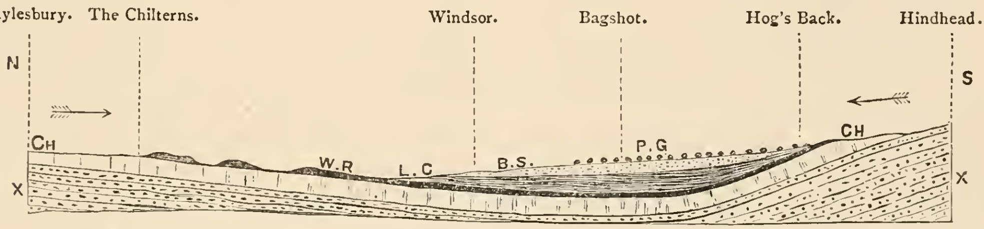

Fig. 84.—Digrammatic Sections through Windsor; showing probable position of Strata at end of Eocene.

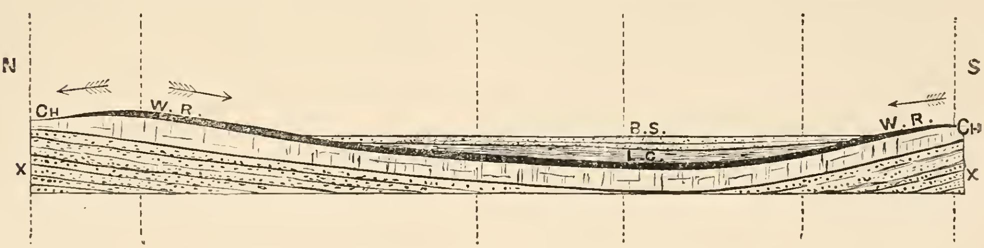

Fig. 85.—Showing probable position of Strata during Pliocene.—P G, Plateau-gravels; B S, Bagshot Sands; L C, London clay; W R, Woolwich and Reading Beds; CH, chalk; X, formations older than the chalk.

The causes of such differential movements of parts of the earth's lithosphere were briefly discussed, and referred to contraction of the crust as the prime factor. The Kingsclere-Hindhead axis of elevation, like the Wealden axis of elevation which was connected with it later on, was thus regarded as a slight wrinkle in the crust, or one of a series of slight wrinkles, determined by the slight circumferential approximation of the two great stable archæan and palæozoic masses of Central Europe and France on the one side, and of the north and west of Britain on the other; the weaker and newer strata of the intermediate area getting pinched up and slightly folded. This was shown to be strictly comparable with the effect of the later Tertiary movements of the Alpine chain upon the intervening Secondary and Tertiary strata, as indicated in the section across the Upper Po-Basin, which the author has recently received from Professor Sacco, of Turin.*

The estuarine character of the London Clay, and its gradual passage upwards from deposits having the character of those of a marine estuary to those of a more constricted river-mouth, were pointed out; and the evidence adduced from Foraminifera by Professor Rupert Jones, and from the fauna and flora in general by Professor Prestwich, as to the depths of the waters, in which the deposits were laid down, were briefly discussed. The significance of the distribution of septaria and a molluscan fauna chiefly in the lower 200 to 300 feet of the formation, as discussed by the lecturer several years ago,† was also pointed out, as well as the indications which the organic remains give of the prevalence of a tropical or sub-tropical climate in Eocene times. Ascertained thicknesses of the London Clay, beneath the overlying Bagshots (i) at Hampstead 300 feet, at Wokingham 270 feet, at Bearwood 250 feet, (ii) at Wellington College 330 feet, at Brookwood 370 feet (or more), at Chobham Place 400 feet, at Claremont 450 feet, and at Wimbledon 430 feet, were cited as indications that the line of greatest depression during the London Clay period was some miles further south than the present line of the Lower Thames. The areal extension of the London Clay, and its gradation of thicknesses from east to west, tell us that the area of depression was a synclinal with its axis inclined to the east; in other words, it took the form of a segment of a cone rather than of a cylinder, forming what Sacco has called a "cone of depression" ("cona di déjezione."). The elevation of the Kingsclere-Hindhead axis subjected the Chalk strata first to the action of sea-waves, which manufactured from its flints the numerous pebbles found in the Reading beds, as well as the few which are scattered through the London Clay; and we should probably not be far wrong if we considered the denudation of the Weald as having in places cut through the Upper Chalk by the close of the London Clay period; but we have no evidence to show that the Wealden elevation at this early stage was anything more than a part of a plateau-like region similar to that on the Mercian side of the Tamisian area. For all we know it may have been such, and have continued to rise, without much change in its contour-details through the whole of the Eocene, Oligocene, and Miocene periods, until the Wealden anticline proper began to take its shape in the Pliocene period. We shall return to this later on.

* "La Geo-tectonique de la Haute Italie Occidentale," "Bull. de la Soc. Belge de Geologie, &c.," tome iv., 1890.

† See "Geol. Mag.," 1886, No. 9, on "The Unconformity between the Bagshot Beds and the London Clay."

Condition of things in later Eocene time.

The established attenuation of the sands which are known as Lower Bagshot, which in many of the more central parts of the area seem to form an upward extension of the London Clay formation, and which Professor Prestwich* has recently correlated on such grounds with the London Clay under the name of the "London Sands," tells us of the further accentuation in later Eocene time of the structural features already initiated, as we have seen, for the south of England; while the fact, that either these sands, or the overlapping Bagshot beds of higher horizons, rest upon the lower portions of the London Clay with molluscan remains and septaria along the northern flank of the area, affords indication of the progressive accentuation of the synclinal† during the portion of geologic time indicated by those deposits. Silting up proceeded; things seem to have become stationary for a period; deltaic clays and lagoon-deposits were laid down, certainly from as far west as Newbury, to a long distance towards the east, as far, at least, as Essex, as indicated by the section through Brentwood Common, recently published by Professor Prestwich.‡

Wokingham, Bracknell, Warfield,§ and possibly Windsor Park itself, were mentioned, as localities where this transgressive relation of the Bagshot strata to the London Clay seems to be indicated; while further east, at Hampstead ‖ and Brentwood ¶ a similar relation of things can be traced. On the south side of the Eocene formations of the Tamisian area the high dip of the strata has led to more extensive denudation, and so we cannot adduce such good evidence; nevertheless there are reasons for regarding certain outlying masses of Tertiary sands

* "Journal of the Geol. Soc.," February, 1888.

† Such a progressive accentuation of a synclinal flexure has been well worked out in the case of the basin of the Po by Dr. Sacco of Turin. See his valuable paper, "Classification des Terrains Tertiaires," "Bull. de la Soc. Belge de Geologie," &c., tome i., 1887. In that region the accentuation seems to have gone on intermittently all down through Tertiary time, while in the Thames area it appears to have been intercepted by elevation at the end of the Eocene.

‡ "Journal of the Geol. Soc.," vol. xlvi., Pl. vii., Fig. 5.

§ See the author's papers, *ibid.*, vols. xliii., xliv.

‖ "Mem. Geol. Survey," vol. iv., p. 309.

¶ Prestwich, "Journal Geol. Soc.," *loc. cit.*

on the North Downs at altitudes of 500 feet to 600 feet as belonging to the Bagshot or later Eocene; and these lie either on the Chalk or on the Reading Beds. This has been discussed by the author elsewhere.* If, as the hypothesis requires, some accentuation of the synclinal during the latter part of the London Clay period and during the Bagshot period, took place (against which no *à priori* reason can be alleged), the facts just enumerated would receive a rational explanation. The Upper Bagshot Sands, however, retain remains of a fauna, which indicates the conditions obtaining in a marine estuary; and as these have now been identified as far west as Highclere it would seem that towards the close of the Eocene period a narrow arm of the sea extended from the open sea towards the east, westwards as far as the place just mentioned, and perhaps somewhat further. This will be better understood by reference to the section (Fig. 1), which is, of course, like the next, only a diagrammatic representation, drawn through the longtitude of Windsor, of what was probably the relation of things in the Tamisian area towards the close of the Eocene period.

THE PLIOCENE PERIOD. (See Fig. 85.)

In the shallowing of the waters of the Hants and Seine Basin during the Oligocene period, we seem to have the initiation of a more general upward movement, which perhaps continued through the Miocene; the failure to identify any deposits of the latter period in the London and Paris Basins going to show that the south-east of England (as well as the north of France) were for all that length of time dry land, the superficial strata therefore undergoing destruction by atmospheric agencies. The chalk especially must have suffered enormous waste through the removal of its carbonate of lime by carbonated atmospheric waters, leaving its flints (in some places largely mixed with the clay residue of the chalk) to accumulate upon the uplands, both on the north and south sides of the Tamisian valley. just as we see them at the present time accumulated upon the chalk downs above Ventnor.†

With the Pliocene movements the Weald probably attained its maximum elevation; though there are reasons for supposing that this elevation was not commensurate throughout the whole distance, but somewhat in excess towards the western part, which was lifted above the sea, while further east marine waters still encroached upon it to a much greater extent, depositing strata of which the well-known Lenham deposits are the remnants.‡ This is further borne out by the fact that on the north side of the Tamisian area there must have been towards the east some depression, with the consequent encroachment of the waters of the Anglo-Germanic Sea, laying down the Crag of the Eastern Counties, and filling up the valleys and hollows which had been cut into the London Clay during the preceding Miocene elevation of the area. The great Pliocene elevation of the Weald, which, working independently, both Professor Prestwich and the author have come to regard as the most important factor in determining the present surface-geology of the south-east of England, which also probably had its counterpart in a more regional elevation on the Mercian side, would seem to have two most important results: (1) it gave *a general tilt to the north of the Eocene strata of the Tamisian area*, and so threw the main line of drainage further north, *initiating the present actual Thames Valley*, while erosion was facilitated along that line by the weakness of the strata themselves; (2) a higher gathering-ground for tributary waters from the Wealden hill-range, and a general declivity to the north of the Eocene area, furnished the requisite conditions for the transport of the flints of the Chalk region, the flint pebbles washed out of the Eocene beds as their destruction on the north flank of the Weald advanced, and the Neocomian chert fragments, which, together with the flints and a few quartz pebbles, constitute the materials of the Plateau-gravels.* The erosion of the uplands of the Weald had evidently by this time, made such deep incisions into the strata, as to lay bare to the action of denuding agencies considerable portions of the Neocomian or Lower Greensand; though this proceeded slowly enough for the transverse drainage to cut down its valleys through the Chalk escarpment, which even then must have begun to take shape.

The one incision of this kind across the strike of the chalk on the Mercian side of the Tamisian area, that of the Pangbourne and Goring gorge, was in all probability initiated too in Pliocene time, but the area of drainage concentrated upon this line was much smaller than at present. It would appear that the head-waters of the present Ouse are cut off from those of the Cherwell and the Thame by a watershed largely composed of glacial drift; at least the author's own observations of that district have led him to regard this as probable. If this were so, we should have to date the outlining of the present Upper or Oxford Basin of the Thames rather late in Quaternary time, the Pangbourne gorge having been no doubt deepened considerably during the Glacial period.

The tilting to the north of the Eocene strata, as a result of the great Pliocene elevation of the western portion of the Weald, perhaps affected the more

* "Geol. Mag." for September, 1890, pp. 403 *et seq.*
† See the author in "Proc. Geol. Assoc.," vol. viii., "On the Bagshot Beds of the London Basin, and their Associated Gravels;" also the "Journal of the Geol. Soc.," vol. xlvi., p. 558.
‡ See "Geol. Mag.," *loc. cit.*

* "Journal of the Geol. Soc.," *loc. cit.*; also Prestwich, *ibid.*, vol. xlvi., on the Southern Drift.

easterly portion of the area but slightly. If the great east-and-west fault, which has been traced along the Thames Valley below London,* can be dated back to Pliocene time, it probably had much to do with the definition of the main line of drainage towards the east. With this great Pliocene movement was also connected probably the minor differential movement, which lifted up the Chalk and Eocene strata along the Windsor-Marlow axis, turning the course of the ancient valley still further to the north between Reading and Windsor, and accounting for the elevation of the chalk which forms the site of Windsor Castle. The present angle which the river makes, as it turns northwards to Henley, has perhaps been the result of special and local erosion of the Eocene strata at a somewhat later period, owing to the great increase of the erosive power of the river, after the deepening of the Pangbourne gorge, and the inflow of the waters collected from the present Oxford Basin.

The case here supposed of the determination of a main line of drainage by a general tilting of the strata is not a solitary instance of the kind. It can be paralleled, on a much grander scale, by the general tilting (also to the north), of the great Tertiary series of strata deposited in the narrow Helvetico-Germanic sea, which skirted the Alpine chain before the period of its last and greatest elevatory movement. Across the gentle declivity thus formed of Tertiary strata the drainage of a great part of the Alpine chain, including the whole of the Eastern Alps, now finds its way to join the Upper Danube, which, as von Dechen's Map of Germany shows, skirts the old Mesozoic country of Bavaria and Würtemberg, and the still older Archæan region of Upper Austria, all the way from its emergence from the Black Forest country down to Krems. This we must certainly connect with the last Alpine elevation.

(*To be continued.*)

* Whitaker, "Mem. Geol. Survey," vol. iv., p. 353.

SCIENCE-GOSSIP.

Dr. W. Somerville has been appointed by the Techinal Education Committee of the Northumberland County Council to the Professorship of Agriculture and Forestry recently founded in the Durham College of Science, Newcastle.

We are sorry to announce the death of an old and frequent correspondent of Science-Gossip, Mr. Andrew Brotherston, of Kelso, at the age of fifty-seven.

Between December 9th last year and February 5th, seven great bustards (*Otis tarda*) were shot (of course!) in Norfolk, Suffolk, Essex, Sussex, Hants, Wilts, and Carmarthenshire.

Mr. S. W. Burnham, with the great Lick refractor (California), has observed the nearest companion of Aldebaran, while passing through its periastion at a distance of only 0·13″ from the large star. And from old measures of position, angle, and distance, he has obtained a satisfactory orbit.

Mr. Edward Bartlett (son of Mr. Bartlett of the "Zoo") has been appointed Curator of the Government Museum at Sarawak.

The following are the Lecture Arrangements of the Royal Institute after Easter:—Mr. J. Scott Keltie, Three Lectures on the Geography of Africa, with special reference to the Exploration, Commercial Development, and Political Partition of the Continent; Dr. E. E. Klein, Three Lectures on Bacteria: their Nature and Functions (the Tyndal Lectures); Mr. William Archer, Four Lectures on Four Stages of Stage History (the Betterton, the Cibber, the Garrick, and the Kemble Periods); Professor Dewar, Six Lectures on Recent Spectroscopic Investigations; Dr. A. C. Mackenzie, Four Lectures on the Orchestra considered in connection with the Development of the Overture; Professor Slyvanus P. Thompson, Four Lectures on the Dynamo; Mr. H. Graham Harris, Three Lectures on the Artificial Production of Cold; Professor A. H. Church, Three Lectures on the Scientific Study of Decorative Colour. The Friday Evening Meetings were resumed on April 10th, when a Discourse was given by Sir William Thomson, on Electric and Magnetic Screening.

Good news for potato growers! Sulphate of copper has been found not only an antidote to potato disease, but also highly conducive to an improved and heavier crop, in some instances to the extra value of 5*l.* an acre.

Mr. C. Vernon Boys has been making measurements of the heat of the moon by means of his very delicate radiomicrometer. His method was to focus the rays of the moon on the face of the radiomicrometer by a reflecting telescope of 16 inches aperture. In the case of a new moon, he found that the heat coming from its disc diminished as you passed from the convex to the concave edge, and that from the dark surface was so slight as not to affect the apparatus. The maximum radiation of heat came from points of the disc itself, not from its limbs. At full moon the maximum point was at the centre of the disc. The side of the moon which had been exposed to the sun for fourteen days was not warmer than that which had been exposed for seven days. No sensible heat was observed to come from the stars.

THE Eleventh Annual Exhibition of the S. London Entomological Society, was held at the Bridge House Hotel, London Bridge, S.E., on Wednesday, the 15th ult., and was continued on the Thursday following from 1 P.M.

MICROSCOPY.

PRESERVATION OF MELICERTA RINGENS.—Last May you inserted a paragraph bearing the above heading, in which I narrated how I had preserved in captivity this organism for twelve months without any interregnum. I have to-day to recount a further success in this matter. During the last year I have never been without numbers of this rotifer; at the present time I have very many. Only once have I feared that I might lose this attractive creature altogether, and this was on my return home last October, after my autumn holiday. I found during my absence that certain juvenile members of my family, out of the overflowing kindness of their hearts, had fed the sticklebat with pieces of biscuit as large as hazel nuts, and the plants, too, had been permitted to grow unpruned; consequently, on my return, I found the whole aquarium exceedingly offensive, necessitating a thorough cleansing. This was given, together with a reduction in the amount of plant-life, and the first change of water for over two years. The pruning of the weeds proved to be a somewhat dangerous experiment, plant growth at this season of the year naturally almost ceasing; this, together with the exceedingly severe winter, for a short time imperilled the maintenance of the whole. Fortunately all, however, has gone well, and melicerta has continued abundant; so numerous, indeed, as to become so crowded upon the somewhat scanty plants as to cause them to attach their tubes to one another in the manner we are informed more common in the American waters than our own. I have to add that I still consider the plants named in my previous communication to be very good plants for a small aquarium. The sticklebat still survives. Can any reader inform me as to the natural duration of life of this fish?—*J. W. Measures, M.R.C.S.*

ZOOLOGY.

MOUNTING SHELLS.—From a paragraph in the April number of SCIENCE-GOSSIP, I see that a correspondent has got into difficulties on the above subject. To my mind mounting good shells on tablets is downright sinful, as, no matter what mounting media are used, the specimens are certain to be more or less injured. Though I do not "mount" my own collection, I can speak with considerable experience as to its pernicious effect, as only too many of the specimens I receive in exchange are spoilt by one or more unsightly patches showing where they have formerly been fixed to tablets. Judging from the instances I have seen, the various gelatine cements, especially those which are applied in a heated condition, are the worst offenders. At the Natural History Museum I believe they are very thick gum arabic, which is open to less objection, but perhaps the best cement, though possibly not a very secure one, would be wax (preferably such as is used for modelling) as it can be readily softened by moulding in the fingers. But why mount shells at all? a collection is far more useful when it is possible to take up each specimen separately and examine it on all sides without the necessity of first detaching it from a mount. Undoubtedly the best, though unfortunately rather expensive, method of storing shells is to keep them in glass-top boxes, rectangular being superior to circular ones. The most convenient dimensions are: depth three inches; width two and four inches; length, varying in half inch steps, from one inch upwards. The British Mollusca and part of the general collection at the Natural History Museum are arranged in this way. Card-board trays come next in order of merit, and as they can be easily and quickly made by an amateur after very little practice, are very cheap. The superficial dimensions given above for boxes will be found convenient for these also, but a depth of half an inch is sufficient. In order to save work, the corners need not be bound. In my own collection through want of funds, boxes and trays are used together in the same drawer, the boxes being reserved for delicate specimens which might be broken if loose in a tray. As the boxes and trays are made on the same system they fit in exactly. While on this subject, I might refer to another method of spoiling shells, namely writing on the specimens themselves. Names and other information should always be written on a slip of paper placed in the box or tray, but I hope soon to speak about labels more at length.—*S. Pace, 252 Fulham Road, S.W.*

A NEW VARIETY OF HELIX CANTIANA.—The specimen to which the following description applies was taken from near Sittingbourne, in Kent, by Miss Muriel Norton, and forwarded to me for the purpose of naming by Mr. W. E. Swanton, who has it now in his collection. As far as I am aware, the variety is new—indeed, very few varieties of *H. cantiana* have been described—but, as its deviations from the type are distinctly marked, I have considered it worthy of a variety-name, and have called it var. *canaliculata*. The specimen resembles in some features what I have previously described as var. *elevata* in the first number of the "Conchologist" (readers of this note of mine on this variety will kindly oblige the writer by erasing the semicolon between the words "spire" and "compressed," and in reading "canaliculate" instead or "canaliculata,") but, in this instance, the spire is depressed and does not rise about half a millimetre above the body-whorl. Var. *canaliculata*, Willms. Shell white, rather solid; suture between body-whorl and preceding whorl deeply and triangularly canaliculate; spire depressed and very slightly elevated above the upper level of the body-whorl; umbilicus somewhat wider than in type and exposing more of the whorls within. Width fifteen mill.; height nine mill. The most distinctive characteristics are the sub-depression of the spire, and the deep triangular canaliculation of the suture between the body-whorl and the spire.—*J. W. Williams.*

Twice-Used Nests.—In the April number of Science-Gossip, p. 93, Mr. H. G. Ward records an instance of a blackbird using the same nest for a second brood immediately after the first had flown. I had two similar instances lately in my garden. Both the blackbird and the thrush used the same nest in the same season for successive broods. The thrush was successful in rearing both broods, but the blackbird was unfortunately interfered with by a cat. I mentioned the circumstance at the time to Mr. Seebohm, who said it was very unusual.—*J. Jenner Weir, Beckenham.*

Rossendale Rhizopods.—In the last paper on this subject, Fig. 59, 60, 61, should be *Amœba proteus.* The names of Figs. 63 and 66 should be transposed.

Deep Sea Exploration in the Eastern Mediterranean.—The investigations which the expedition sent out by the Vienna Academy of Sciences has been carrying out in the eastern portion of the Mediterranean have been very successful. The investigations concerning the depth and general characteristics of the sea, and the presence of life in it, were carried out at seventy-two distinct points. The greatest depth (3700 metres, or over 2¼ miles), was found near the great depression which runs between Molla and Cerigo—a deep valley running in a direction from north to south, and with a depth varying from 3500 to 4000 metres, the descent being much more abrupt on the Greek side than on the Italian and Sicilian side. Experiments as to light showed that the waters are more transparent near the African coast than in the northern portions. There white metal plates were discernible at a depth of nearly 144 feet. Sensitive plates were still found capable of being acted upon by a light at a depth of nearly 550 yards (2½ furlongs), at a point 200 marine miles north of Ben-Ghazi; on being drawn up they were found to have been blackened. The acid constituents of the sea-water seem to be the same at the greatest depth as near the surface, nor is any difference in the quantity of ammoniacal constituents perceptible between the upper and the lowest levels, with the exception that everywhere close to the bottom the quantity of ammoniacal ingredients is notable. The deep-sea region of the Eastern Mediterranean is very poor in animal life. A dredge at a depth of 3000 metres brought up no animal specimens at all, but at a depth of 2000 metres leaf-formed algæ were discovered similar to those found at the same depth in the Atlantic by the Panton expedition.

Ornitholological Notes from Chichester.—The excessive severity of the past winter, prolonged almost without intermission, save for a brief respite of beautiful weather in February, from the close of November to the beginning of April, caused a terrible destruction of bird life. Perhaps none have suffered worse than those sweet songsters the thrushes (*Turdus musicus*), numbers of which, with their relatives the redwings (*Turdus iliacus*), and fieldfares (*Turdus pilaris*), died either from cold or starvation. Swarms of wildfowl visited our shores, and received, alas! poor things, in many cases anything but a hospitable reception; for, rightly or wrongly, according to our particular standpoint, I suppose—though as a member of the Selborne Society I must enter my protest—the sportsman embraced what to him was, as all cold winters are, a golden opportunity for sport. Amongst other common birds the following were seen, and some of them shot in the neighbourhood of Chichester in the months of December and January: Wild Swans: Hooper (*Cygnus musicus*). Of these a flock of thirty-one was seen off Selsey. Geese: The common Brent-goose (*Bernicla Brenta*) has abounded. Specimens of the bean goose (*Anser segetum*), and of the white-fronted goose (*Anser albifrons*), have also occurred. Ducks: Twenty-eight Sheldrakes (*Tadorma cornuta*) were observed together in Chichester Harbour, as well as a number of tufted ducks (*Fuligula cristata*), and scaup ducks (*Fuligula marila*). Smews: Two smews (*Mergus albellus*) were taken at Fishbourne, and two or three goosanders (*Mergus merganser*). Bitterns: Two bitterns.—One at Fishbourne, and one at Earnley. The above communication from a capital sportsman-naturalist will prove interesting to many of your readers.—*Joseph Anderson, jun., Hon. Curator, Chichester Museum.*

BOTANY.

Variations of Colours in Plants.—In the Black Mountains on the borders of Monmouth, Brecon, and Herefordshire, the harebell, and many other species of bell flowers, grow very profusely. Some years ago I found a few white harebells in the Grwyne Fechan Valley. As botanical friends rather doubted this, during the season of 1890, I paid some attention to the variations in colour of these flowers. All through the Black Mountain country the harebell varies from a reddish purple to a very pale shade of blue, and white specimens are not infrequently met with. Generally, the white harebells look like washed-out blue ones, with a very faint tinge of blue and a somewhat sickly appearance. I have, however, very rarely found a strong growing plant with opaque, creamy white flower, notably last August one plant on the N.E. slope of Mynydd Pen y fal, near Abergavenny. These really white harebells almost seem like a distinct variety. Is not the white harebell commoner in France than in England? Anne Pratt mentions it, giving the popular name, I think, as "la religieuse des champs;" but I unfortunately have not her "British Flowering Plants" by me now. In addition to the plants named by your correspondent, Mr. H. G. Ward, we found last year in a lane between Abergavenny and Crickhowell the common scabious (*Knautia arvensis*) with perfectly white flowers. In the parish of Henllis, near Newport, columbines occur in purple, blue, rose pink and white. The bugle is occasionally found white, and the common wood sorrel is occasionally red. Around Newport the common purple orchis (*O. Morio*), where it grows in abundance, is always found in four colours, viz.: purple, coral pink, light coffee colour, or écru and white, the lighter colours being the least frequent and the green lines in the hood being a striking feature in them. In the Quantock country, in Somersetshire, the bee orchis is found with three white petals.—*Thomas Jones, Newport, Mon.*

The Post Office and Botanists.—Would any brother botanists, who have exchanges with foreign countries, join me in trying to obtain the same privileges from the Post Office, as our foreign confrères have? They are able to send their plants here as "business papers" by the printed matter post, costing them about 4*d.* per lb., whereas we have to pay Parcel Post rate even for a few ounces, or else letter post rate at 2½*d.* per ½ oz. The lowest rate for foreign Parcel Post is about 1*s.* 2*d.*, and to the United States, Letter Post is the only one we can send plants by, there being no Parcel Post. From the States parcels of plants can be sent here at 4*d.* per lb., and the packets may weigh up to 4lb. To make a return exchange, for these we have to pay through the Parcel Express Companies at about 1*s.* and upwards per lb. Could not a petition to the Postmaster-General be got up about this? I believe that among the United States postal regulations, there is a special one regarding the postage of dried plants.—*A. E. Lomax, 56 Vauxhall Road, Liverpool.*

Flora of Kent.—With reference to paragraph on this subject in April number, p. 90, there is no complete Flora of the county; but Cowell's "Floral Guide to E. Kent," "Wild Flowers of Dover and Neighbourhood," and Jenner's "Flora of Tunbridge Wells," may be consulted with advantage. Also G. Smith's collection of rare plants from S. Kent, D. Cooper's "Flora Metropolitana," Irvine's "London Flora," and E. de Crespigny's "New London Flora for W. Kent," besides the Report of the Greenwich Natural History Society of the District between the Rivers Cray, Ravensbourne, and Thames. Milne and Gordon, N.E., and S. Kent, 1792; and T. Johnston's "Iter," N. Kent. N. and S. Kent, 1629 and 1632, would be too antiquated to be at all useful; as also would be Petiver's "Journey from London to Dover," and Blackstone's "Species;" but there are many records of later date to be found in the pages of the "Phytologist," from 1855 to 1862; in those of Science-Gossip; Exchange and Locality Record Clubs' Reports and other periodicals; not to mention Watson's "New Botanist's Guide." Dr. de Crespigny's Handbook may be procured at Messrs. Allen & Co.'s, Limited, Waterloo Place. A new edition is ready for the press, revised, rearranged, and with much additional matter, itinerary and chart 35 to 40 miles round.—*Ede.*

Cuticles of Leaves.—What is the best way of getting the cuticles of geranium and leaves such as abutilon, and *Cheiranthus incana* so as to mount them as transparent objects? Jabez Hogg, in his work on the Microscope, recommends, p. 440, "immersing the leaf in sulphuric ether," but as his book was written in 1856 I thought some fresh way might have been found out since that time.—*G. A. Hankey.*

A variety of the male fern (*Lastrea pseudo-mas*) has been found by Mr. Wilson, of Alford, N.B., which is new to botanists. Fronds have been also examined by Mr. Wollaston, of Chislehurst, who calls it *Lastrea pseudo-mas*, var. *multiformis*, Wilson (Wol.). The nearest previously-known form to this was found by the late Mr. Barnes, of Levens, in Lancashire.

GEOLOGY, &c.

On Phosphatic Chalk at Taplow.—The following highly important paper was read at the last meeting of the Geological Society, by Mr. Strahan. Two beds of brown chalk in an old pit near Taplow Court owe their colour to a multitude of brown grains. These grains are almost entirely of organic origin, foraminifera and shell-prisms forming the bulk of them. Mr. Player has analysed specimens of the brown chalk, and finds that it contains from 16 to 35 per cent. of phosphate of lime. The tests as well as the contents of the foraminifera seem to have been phosphatized, the phosphate appearing as a translucent film in the former case, and as an opaque mass in the latter. In the case of the prisms of molluscan shells, the whole of the phosphate appears to be in the opaque form. Minute coprolites also occur, together with many small chips of fish-bone, in which Dr. Hinde has recognized lacunæ, while some have been identified by Mr. E. T. Newton as portions of fish-teeth. Mr. Player observes that the phosphate occurs in such a condition that it would not improbably serve as a valuable fertilizer, without conversion into superphosphate. This condition is probably due to the partial replacement of carbonate of lime by phosphate in the organisms. The removal of the remaining carbonate leaves the phosphate in a honeycombed state, peculiarly favourable for attack by the acids in the soil. Mr. Strahan commented upon the resemblance of the deposit to the phosphatic chalk with *Belemnitella quadrata* which is largely worked in Northern France, and upon a less striking resemblance with that of Ciply, which is at a higher horizon. In the discussion which followed, Dr. G. J. Hinde said that he had examined microscopically the phosphatic chalks of Taplow, and compared it with the similar material from Douillens and Ciply, and he fully agreed with Mr. Strahan's description thereof. The fine, white, powdery portion of the Taplow rock consisted nearly entirely of Coccoliths, Discoliths, and Rhabdoliths, unaltered and of carbonate of lime similar to those in the normal white chalk. The minute, translucent, angular fragments in the granular portion were shown to be pieces of fish-bone by the occurrence in them of true bone lacunæ and canaliculi, and many were likewise thickly penetrated by borings of algæ or fungi. Similar fragments were present in the Douillens and Ciply material, but their osseous nature had not previously been recognised. The minute phosphatic pellets were probably coprolites of small fishes. The evidence pointed to the exuviæ of fishes as the source of the phosphatic materials in these deposits. Mr. Whitaker said that, from the regularly bedded character of the phosphatic chalk, one would have expected it to occur for some distance from the pit; but no trace could be seen either of the phosphatic beds or of the flintless chalk in which they occur. It seems as if the topmost chalk here occurs only over a small area, having been eroded elsewhere. That this was the case to the west and north-west had been surmised by Mr. Jukes-Browne ("Geology of London," vol. i. pp. 76–78, 1889), from an examination of fossils collected from the various pits; but the thinning-out of the top chalk seems to be more sudden than was expected, and not only in the above directions but all round from Taplow. Mr. Strahan's discovery showed how much there might remain to be done, even with regard to so well-known a formation as the chalk. Professor Judd remarked upon the interesting nature of the microscopic borings described by Dr. Hinde. His attention had been of late directed to the subject in connexion with the curious organisms found in Oolitic grains, both recent and fossil. Both Mr. G. Murray and Dr. Scott were of opinion that these borings were produced by the plants that had been so well described by the distinguished French algologist, Bornet. A very acute observer, Mr. F. Chapman, had noticed that shell-fragments in the gault frequently exhibit these borings, and Dr. Scott had been able to identify several of Bornet's genera, founded on recent specimens, as being represented in these Cretaceous shells. Bornet believed that these boring algæ perform a very important part in the economy of nature, by bringing about the destruction and solution of shell-fragments. The president, alluding to the geological and economic interest of the discovery described in the paper, remarked that though the area occupied by the phosphatic layers seemed to be small, there was good reason to hope that somewhere else in the Upper-Chalk districts the same or similar bands might yet be found. The search for such deposits would now be stimulated by the information so fully supplied by the Author, who himself would no doubt follow up his observations at Taplow by a thorough examination of the higher members of the chalk in the east of England.

Note on the Occurrence of Cockroach Wings in the Coal Measures of the Forest of Dean.—I am indebted to Mr. Lawe, of Pillston Penna, for the information that two entire wings and a fraction of a third were received by him amongst a collection of fossil plants from the above locality and horizon, sent by myself. I noticed the specimens when packing them, but thought them (perhaps new) fern pinnules. I am in ignorance as to whether these insects have been recognised before in that locality or not; but they are certainly scarce. Of the two specimens one was possibly the counterpart of the other.—*T. Stock.*

NOTES AND QUERIES.

Snails as a Cure for Consumption.—In an old MS. book full of receipts, which were put together by Robert Sexton, an old excise officer, about the year 1794, I find the following recipes as cures for consumption, which show that the snail-cure was recommended to a later date than we generally acknowledge by the medical faculty to the phthisical patients. The first, on the authority of one, Dr. Simmons, runs as follows:—"Oysters will sometimes be beneficial, and so will snails either swallowed whole or boiled in milk—cow's milk, if warm from the cow, diluted with one-third of water; in general, buttermilk or whey, either from cows or goats, is far preferable to new milk, but to be beneficial it should be the principal food." The second recipe, given on no authority, is in the following words:—"Boil half-a-dozen of red garden snails every evening in a quart of sweet milk or whey, then strain the liquor through a coarse cloth and drink it with sugar every morning gradually upon an empty stomach, and repeat these draughts for a month or two if required." This extract goes on to say that *Helix pomatia* has been used also for "open hæmorrhoids," by applying "fresh snails" to the affected part every two or three hours.—*J. W. Williams.*

Habits of the Crossbill.—I saw a flock of ten crossbills feeding in a larch tree at Ballyhyland, co. Wexford, on the 15th of January. They are rare visitors here, and these birds allowed me to walk freely all round and under the tree they were in, for half-an-hour or so, but the light was so bad that I failed to get a satisfactory view of their plumage, a point of such interest in the crossbill. As one of these crossbills was feeding near the extremity of a bough, I saw another come hopping to him along the branch from the end next the trunk. The feeding bird, seeing the other approach, stopped eating, and gravely opening his beak took that of his visitor into his mouth. The two bills were then slowly drawn apart again, the one crossbill unconcernedly resumed his eating, and the other hopped away. Some minutes afterwards I saw the very same process gone through again. The bird visited was, I am pretty sure, the same on each occasion; about the identity of the visitor I am less clear. The grave demeanour of the birds was very entertaining to witness. I am quite at a loss to know the nature of the transaction. Was it (1) an old bird feeding her young; (2) a cock bird feeding his mate (either would be a remarkable fact, seeing it was the 15th of January, and very harsh weather); or (3) may we suppose that the crossbills occasionally suffer inconvenience in feeding from getting bits of scales impaled on their curiously-formed mandibles, and that in these emergencies they come to each other to be relieved. The act, as I saw it, seemed to me more consistent with this last explanation. There was not the smallest symptom of an emotional greeting, a flutter of wings, or a note of welcome or expectancy, such as usually happens when a hen bird or a fledgeling of one of our common species is fed by its mate or parent. It was clearly a visit of business, regarded by both in the light of a passing interruption to the routine work of devouring the larch-cones.—*C. B. Moffat.*

Galvanised Wire and Orchids.—I find that galvanised wire kills orchids. I tied galvanised wire round some orchids to keep the moss on the roots, and most of them died, one plant especially I wish to draw attention. It was a plant of *Cattleya crispa* in full growth. To hang the plant up I had a band of galvanised wire placed round the pot and wire from this band formed a loop. I must relate that the plant in question had vigorous roots clinging to the sides of the pot. All these roots died, and then the plant. Since then I have taken the galvanised wire from the pots, etc., and replaced with copper. Since then the orchids are in better health.—*R. Draper.*

Bats flying in Sunlight.—On the 16th February, about ten o'clock on a brilliantly fine and warm morning, I watched two flitter mice-bats (*Vesperugo pipistrellus*, Schreb.), for some time. They were hawking to and fro for the numerous flies that were abroad. I have never seen bats following their avocations in the bright sunlight before.—*J. E. Taylor.*

Trees in Trees.—A friend who has had experience in tree growing tells me that a young tree, as for instance an elm, grows much more rapidly when planted inside a hollow tree, say an elm, than under any other conditions. Looking to the quantity of decaying vegetable matter from which the roots of the young tree derive part of its nutriment, this does not seem at all improbable.—*T. S.*

Dead Thrushes in Rabbit-Holes.—Seven dead thrushes were taken from a rabbit-hole at Aust, Glos., into which they had retired to die during the late severe weather. Several birds that were picked up dead from starvation, were difficult to skin, just skin and bone, light as a feather.—*T. S.*

Cuticle of Leaves.—Could any of your readers inform me the best method of taking off the cuticle of leaves of Scolopendrium, petals of the Geranium, &c., so as to make them as transparent objects for the microscope? I am told that "nitric acid, diluted with half water, is the old-fashioned way. Could any one inform me of the new-fashioned, or any better way?"—*George A. Hankey, Town Court Farm, Tunbridge Wells.*

Strange Conduct of a Squirrel.—One day in October last, as I was walking through the Phœnix Park, Dublin, I came suddenly on a remarkable sight. A reddish animal was careering in rapid circles around a woodpigeon which was stationed on the ground, and which, in a dazed fashion, kept turning slowly round and round to watch the whirligig performance: in fact, the procedure was almost exactly that which I have seen when a stoat, before killing a rabbit, proceeds to mesmerise it by cutting circles round it, except that the stoat accompanies his circles by wonderful somersaults, which were lacking on the present occasion. The wood-pigeon's behaviour was almost an exact repetition of the rabbit's. Arriving so suddenly on the scene, I unluckily startled the principal performer, who stopped; and, to my surprise, I then saw that it was a squirrel! The bird was at first so utterly bewildered that it was several seconds before she sufficiently recovered to fly away. When at last the wood-pigeon had flown off, and not till then, the squirrel also left the scene, and betook himself up a tree. It would be interesting to know whether such conduct on a squirrel's part has been noticed before, and what would have been the upshot to the affair had it not been interrupted? Is it to be supposed that the squirrel intended to kill the ring-dove?—*Hugh H. Moffat.*

"Two Sides of the Medal"—With reference to the note (p. 71) by Mr. Bird, it is only fair to what seems the only scientific school of evolutionists to state (without hazarding any personal opinion), that it is only those acquired characters which affect the whole organism, and more especially the reproductive elements, that are deemed transmissile to the offspring. The case cited, therefore, of the two men A. and B., one born with big muscular limbs and the other not, is hardly to the point, at least without some further exposition. The other case C. and D. is completely outside the mark as it were. The destruction of thumbs is not necessarily attended with any disturbance of the genital organs; and, therefore, the most fervent Lamarkian would freely admit that D.'s children would be just as likely to have thumbs as those of any one else. It may be useful to append that the well-known researches of Brown-Sequard on the effects of lesions of guinea-pigs, etc., have not been, as far as I am aware, been very destructively analysed or explosively bombarded by any subsequent critic or experimentalist.—*P. Q. R.*

Natural History Vandalism.—Whilst regretting the deplorable sacrifice of bird-life, and the approaching extirpation of the most interesting species, it is painful to find this mischief ascribed by certain journals to naturalists. The destroyers of birds are bird-nesters, bird-dealers and their emissaries, suburban louts who go out on Sundays and holidays, and blaze away at everything clad in feathers. Nor must we forget ignorant farmers, who have latterly taken to destroying that purely insectivorous bird the cuckoo, and infatuated game-keepers who shoot down the owls, our best mouse-catchers. —*J. W. Slater.*

Spiders' Webs.—Some time ago I heard a statement to the effect that "spiders are unable to make more than four webs during their life-time; and that should the fourth be destroyed the spider is henceforth dependent on outward circumstances entirely for a home and its food." I have not been able to find any corroboration of the above statement, and should esteem it a favour if some reader will be able to prove or disprove the above.—*B. Truscott.*

The Marking of Wild Birds' Eggs at the Smaller End.—Why are so very few of the eggs of our wild birds which have variegated markings found to be prominently coloured at the smaller end? The answer to this question is by no means a simple one, and comprises almost endless complications and, indeed, can at best be but indefinite, for this reason, none of our zoologists seemed to have worked out the glands containing the colouring matter of the eggs. So, of course, it is only possible to theorise. In the first place, it would be a sheer physical impossibility, as some people have supposed, for the egg to be turned completely round in the oviduct, it is far too tightly wedged for any gyration of the bird to accomplish such a thing. And, again, this latter theory would imply that the egg usually came down the oviduct with the larger end pointing first, so that it received the bulk of the colouring matter; but this is quite a misleading idea, for it is, with rare exceptions, the smaller end of the egg which points to the exterior, and not the larger. "Why, then, does not the smaller end of the egg, in the majority of cases, receive the bulk of the colour, instead of the larger?" The answer is not very difficult to find. The larger end of the egg, although coming down after the smaller, naturally irritates and distends the colour-secreting glands more than the latter, and therefore receives the bulk of the markings. But why the eggs of the falconidæ and of the corvidæ should be more prone to have small end markings than the majority of other birds is a much more difficult question to answer. It seems to me, and probably many others have also noticed it, that those eggs which most usually exhibit distinct and prominent small end-markings, are those which either have the colour distributed in large blotches over the surface, or are those which vary a great deal in both ground colour and markings, as the eggs of the corvidæ most certainly do. In many cases of eggs marked with large blotches of colour, it is almost impossible to say they are not marked on the smaller end, they are so diffusely and profusely marked all over. Of course there are exceptions to every rule, and it would be impossible to lay down a law confining the small end-colouring of eggs to any particular group of eggs. I have, for instance, in my own collection, specimens of the rook, crow, sparrow-hawk, red-backed shrike, yellow bunting and chaffinch, all very distinctly marked on the smaller end, and all perfectly normal in shape, except that of the chaffinch. I feel that much more might and ought to be written on this subject, and I hope that some one will offer more satisfactory explanation of this freak of nature, than I am able to do.—*K. H. Jones.*

Power of the Limnidæ to resist Cold.—On the breaking up of the late frost I was examining the thick ice on a large stone trough used by me as an outdoor aquarium, when I observed a large number of shells embedded in it. I removed some large blocks and allowed them to melt slowly, afterwards straining the water and placing the shells in a glass. There were a few examples of *Pisidium pusillum*, all dead; *Limnæ peregra* and *L. stagnalis* were in large numbers, all young examples, ready to crawl as soon as they dropped from the block of ice; *Planorbis corneus* and *Pl. complanatus* were also found in quantity, mostly young examples and all living. As the water had been frozen over for six weeks, it is probable that the greater number of these animals has been at least a month in a solid block of ice.—*W. A. Gain, Tuxford, Newark.*

Birds and the Cold Weather.—Owing to the cold weather, no doubt our native English birds have suffered greatly. But perhaps readers would be interested in hearing that I have seen not only a great variety of birds in the garden, but all of which are enumerated here since the frost. They are:—woodpecker, nuthatch, great, little, and blackcap tit, bullfinch, goldfinch, greenfinch, chaffinch, wagtail, siskin, yellow and reed bunting, owl, tree, house, and hedge sparrows, tree creeper, gold-crested, common, and willow wrens, the mischievous jay, wood-pigeon, and the common blackbird and starling; but not a single thrush, which seems about the only kind of bird affected by the cold.—*Frederick W. Freeman, Whitwell, Norwich.*

Extraordinary Entomological Discovery.—Mr. A. S. Canham, of Crowland, has discovered a peacock butterfly beneath a layer of gravel at Crowland, some 20 feet in thickness, in a peat bed. Mr. Canham was desirous of seeing the vegetable formation in this bed, and for this purpose cut out a brick of the peat. He then broke it open, and immediately a butterfly flew out! He captured the butterfly, and it lived for about a fortnight afterwards. Mr Canham supposed that the butterfly was in the peat at the time the gravel was brought down and thus sealed the bed. When the gravel was removed the air penetrated the peat, and the process of incubation was set up; the breaking of the cake of peat admitting more air, promoted the final development of the butterfly, and it flew out. An indentation in the peat coincides with the existence of a chrysalis there, but the shell is lost. The peat and butterfly were exhibited by Mr. Canham before the Peterborough Natural History Society.—*Grimsby News.*

Curious Beliefs.—With reference to a "curious belief" among the natives of county Mayo (Science-Gossip for April, p. 75), I noted a few weeks since a fact which seems to me to bear on the case of the man who ate salmon for a fortnight, and became apparently waterproof. A favourite cat of mine became suddenly very ill, almost unconscious for some days. A veterinary surgeon who saw it, advised us to feed it partly on cod-liver oil; it took about a teaspoonful a day for about two days. By that time its fur, which it never licked or cleaned in any way, became remarkably glossy, and smelt strongly of the oil. May not the oil in the salmon-flesh have a similar result in the case of the fisherman?

Rise of Sap.—I asked a farmer of considerable experience yesterday if he agreed with Mr. Reeves's theories on the ascent or descent of sap. He did not; and adduced the following case, which not long since occurred on his farm. Elms, he said, are gross feeders. If they are in a hedgerow near hops they send up suckers into the hop-gardens, choosing especially the "hills" or hop-plants, which are the most manured. A large mixen had been placed beside a farm-road, about ten feet from a row of elms. It was left untouched for six months, and when cleared away was found to be pierced through and through with elm-roots. Does this make for or against Mr. Reeves's theory?

Query as to Egg.—Will any of the oological readers of Science-Gossip kindly tell me the name of the following egg, taken in this district two years ago? In size and appearance it exactly resembles that of the moorhen, but the nest was built on the ground, like that of the plover, and contained only two eggs. The bird, which I saw several times, was like an ordinary blue pigeon. A friend of mine took several eggs of the same kind, and he informs me that they are quite new to him.—*G. Dixon.*

Fungus on Eggs.—If T. Brown, who complains of fungus in his eggs, will rinse each egg out with a solution of one teaspoonful of corrosive sublimate in a quart of alcohol or methylated spirits, inserted by means of a glass bulb suction-pipe, or a small glass syringe, and expelled with an ordinary blow-pipe, his eggs will never in future be troubled by fungus or anything else of a similar nature. The eggs will be right for ever in any climate or conditions, except in the matter of breakage and such like casualties. The solution mentioned must be used with care, it being a very strong poison.

Second Growth of Raspberries.—The following extract from my diary of last year may possibly interest some of your readers:—"November 19th, observed in the garden of Mr. Young, at Mongeham, near Deal, a second growth of raspberries, ripe and luscious as summer-grown ones." I may add that the garden lies high and exposed and was a few days after covered with snow, the first token of the hard winter which followed.—*J. Wallis, Deal.*

Young Birds and their Nests.—Some friends of mine have had an argument about young birds leaving their nest. The point is this: Do young birds, after taking their first flight, finally leave the nest, or do they return to it as a temporary shelter until they are strong enough to forage for themselves?—*J. E. Gore.*

Local Plant and Bird-Names from North-marston, Bucks.—Cuckoo, early purple orchis; smellsmock, cuckoo flower or ladysmock; crazies, marsh marigold, lesser celandine; blind-eyes, scarlet poppy. [The scarlet poppy received the name of blind-eyes no doubt, from the superstition, that if you got it near to your eyes, or touched your eyes with your hands after gathering it, it would blind you, a belief still prevalent in this village, and elsewhere. Children are cautioned by their parents "not to gather it, for it will blind your eyes," they say. This common saying makes them rather afraid to gather this flower, and thus the pretty scarlet petals of the poppy are left alone to fall, or to be scattered by the wind.] Cows and calfs, cuckoo pint or arum; moons, moon daisy, white ox-eye; halfsmart, yellow bedstraw; kingfingers, bird's-foot trefoil; bird's-eye, germander speedwell. [The name bird's-eye was no doubt given to the germander speedweed by our ancestors, who thought that the flower resembled the eye of a bird.] Celery (or salery), common sorrel. [The leaves of the common sorrel, and the fruits of the mallow are eaten by the children here. The local name of the former flower is perhaps a corruption of the word salad, and the latter name of "cheeses" is from the form of the fruit or seed, which is round and resembles the form of a complete cheese.] Cheeses, mallow (fruit of the); gill-run-the-ground, ground ivy. [The local name of the ground ivy was given to it, from its spreading or running habits over the ground.] Bull-rush, great reedmace; bindweed, large convolvulus; cornbine, small convolvulus; woodbine, honeysuckle. [The local names of the convolvulus (major and minor) and the honeysuckle, needs no explanation, as the derivation of their names is quite clear.] Horse-mint, common mint; burweed, common goosegrass or cleavers; mayweed, corn feverfew; pussy cat, catkin of willow; willow-weed, periscaria; pigeon felt, fieldfare; redwing felt, redwing; gor-crow, carrion crow; thresher or thrusher, song-thrush; then (or fen) thresher, missel-thrush; water wash-disher, water wagtail; yellow wash-disher, yellow wagtail; chink and chinkchawdy, chaffinch; dicky, common wren; heakle or heekle, green woodpecker; redtail, redstart; peewit, lapwing; haybirds, white-throat (major and minor); mollyherne and mollern, heron; woodpigeon, ring-dove; screech owl, tawny owl; bumbarrel, longtailed-tit; green linnet, green-finch; cuckoo's mate, wryneck.—*H. G. Ward.*

Parrots and their Eggs.—A pair of East-Indian tinged parrokeets laid six eggs on alternate days on the bare bottom of a large cage (having refused to use various offered conveniences to nest in); sat twenty-eight days; hatched three, perfectly free from any sort of down. When twenty-one days old, down began to appear, and eyes became partially opened. Owing to their habit of crawling about the cage, two have been killed, but the third (now four weeks old) is well and strong. The parent birds are evidently preparing to lay again.—*B. L. Hooper.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

J. Hunt.—The bound vol. of Science-Gossip for 1872 is out of print, but the publishers can supply you with all the parts for that year, except January.

H. W. D.—Apply to Mr. Geo. Dowker, F.G.S., Stourmouth House, near Wingham, Kent, for information respecting the "South-Eastern Naturalist."

A. Mayfield.—The fossil tooth imbedded in flint is that of a species of Lamna.

EXCHANGES.

Exchange for minerals, &c., good transparent crystals of selenite (various forms), some remarkable in having taken up sand during crystallisation.—W. Gamble, 2 West Street, New Brompton, Kent.

Science-Gossip, 1885 to 1890, complete, with 23 coloured plates: 1880, March and April missing; 1881, September missing; 1884, January, February, March, and April missing. Also "The Naturalist," 1889 and 1890, all unbound, but clean. Wanted, large flat glass-topped boxes for shells in cabinets.—Lionel E. Adams, Penistone, Yorks.

EIGHTY species of British shells, entomological setting-cabinet, collecting-box and store case, to exchange for anything useful.—"Lindens," New Brompton, Kent.

A QUANTITY of duplicate mounts of very choice and rare foraminifera, correctly named, in exchange for cabinet specimens of Alston Moor minerals, or works on freshwater and marine algæ, or offers.—W. H. Harris, 42 St. Brannock's Road, Ilfracombe.

BRITISH birds' eggs. A long series, all with data, such as osprey, hooded merganser, eagle, sooty tern, long-billed curlew, buff-backed heron, capercailie, &c., will exchange for insect cabinet. Several dozen N. American bird skins (dated), fine condition, for exchange. Offers to—H. T. Booth, Upcerne Road, Chelsea.

WANTED, vol. of SCIENCE-GOSSIP for 1872, bound in blue cloth, if possible. Please name price, &c.—John Hunt, Lillyburn Print Works, Milton of Campsie, near Glasgow.

WANTED, unmounted parasites, polycistines, and other good material, in exchange for choice micro-slides of every description. Foreign correspondence solicited.—R. Suter, 5 Highweek Road, Tottenham, Middlesex, England.

WHAT offers for cork setting-boards, zinc collecting-boxes for larva, and light insect collecting-boxes, also Nos. 240–280 of SCIENCE-GOSSIP? Micro-slides or material preferred, or books.—W. E. Watkins, 30 Dalmeny Road, Tufnell Park, N.

EXCHANGE chemical apparatus—retort stands, tripods, glass tubing, corks, crucibles, &c., for fossils, minerals, or rocks.—J. A. Ellis, 1 Pomona Place, Fulham, S.W.

OVER one hundred species of beautifully-mounted ferns, comprising most of the rare British sorts (some very rare), in handsome half-bound book, fitting into strong case. What offers?—Joseph Anderson, jun., Alre Villa, Chichester.

OFFERED, fifty Scottish mosses, a few very rare ones, all named; will send list. Will take a copy of Hobkirk's "British Mosses," second edition.—Thomas Wilson, 39 North Church Street, Dundee.

OFFERED, British marine shells in exchange for micro-slides, insects, other shells not in collection, or any books on natural history. Send lists of wants and duplicates to—W. D. Rae, 9 Claremont Terrace, Alpha Road, Milwall, London, E.

WANTED, Goebel's "Outlines of Classification and Special Morphology of Plants." Exchange Benson's "New Testament," or classical and scientific works, &c.—J. Wallis, Deal.

FOR exchange, twenty back numbers of SCIENCE-GOSSIP, also "Naturalist's Gazette," complete, for 1889 and 1890. Wanted, minerals or fossils, or books on minerals or fossils, or what offers?—William Hetherington, Nenthead, Alston Moore, Carlisle.

OFFERED, a platinum crucible with capsule cover, Beale's "How to Work with the Microscope," and Cruickshank's "Practical Bacteriology." Wanted, ⅙-inch objective, or 2-inch B, C, or D eye-piece, double nose-piece, or offers in petnological slides.—R. M. H. St. Stephen, 25 Fordwych Road, West Hampstead, London, N.W.

SEVERAL hundred British coleoptera for exchange, all carded, correctly named and in fine condition, including many rare and local species. Wanted, offers of any natural history specimens, apparatus, and books on entomology, conchology, or geology.—A. Ford, Claremont House, Upper Tower Road, St. Leonard's-on-Sea, Sussex.

WANTED, British diptera, named or unnamed, foreign coleoptera, or cabinet cork, in exchange for S. African insects of any order.—R. M. Lightfoot, 134 Bree Street, Cape Town, S. Africa.

WOULD any botanist join me in a three weeks' botanical expedition to the Sierra Nevada, Granada, in July next? Address—A. Edward Lomax, 56 Vauxhall Road, Liverpool.

OFFERED, *H. erictorum*, var. *faservata*, *H. variegata*, *H. caperata*, *H. rufescens*, *H. rotundata*, *Z. allcoura*, *C. rugosa*, *L. peregra*, var. *acuminata*, and others. Wanted, *H. pomatia*, *Paludina vivipara*, *P. listeri*, *Acme fusca*, or others not in collection.—James Ingleby, Eavestone, Ripon.

BRITISH cryptogams—mosses, seaweeds, lichens, and fungi, correctly named, in exchange for foreign land shells.—T. Rogers, 27 Oldham Road, Manchester.

Pupa ringens, *P. marginata*, and var. *edentula*, *V. pygmæa*, *V. pusilla*, *V. antivertigo*, *B. perversa*, *C. tridens*, *Z. fulvus*, *Z. crystallinus*, *H. pulchella*, *H. lapicida*, *S. rivicola*, *P. glaber*, *P. dilatatus*, and many others, offered for foreign land shells, or *Testacella haliotidea*, *S. virescens*, *S. oblonga*, *H. revelata*, *P. secale*, *C. biplicata*, *A. acicula*, or good vars. of *H. nemoralis* and *hortensis*.—E. Collier, 1 Heather Bank, Moss Lane East, Manchester.

WILL exchange fifty flint implements for minerals or fossils.—W. Nunney, 29 St. Philip's Road, Dalston, N.E.

WANTED, latest edition of the "Student's Flora" (Hooker). Apply to—John Connor, Elderslie, near Johnstone, N.B.

WANTED, a small collection of British mosses and lichens; fossils given in exchange.—A. Tarver, 34 Croydon Grove, West Croydon.

WILL exchange micro-slides for works on microscope, or exchange slides for others.—Platt, Eastrop, Basingstoke.

WANTED, good specimens of *Littorina obtusata*, var. *ornata*. Will give *Bulimus acutus*, var. *bizona*.—Rev. H. Milnes, Winster, Derby.

OFFERED, *Scalaria clathratula*, *Venerupis iris*, *Mytilus edulis*, var. *pallida*, *Cyclostrema cutlerianum*, *C. serpuloides*, *Spirialis retroversus*, *Eulima bilineata*, *E. distorta*, *E. polita*, *Odostomia interstincta*, *O. spiralis*, *O. nivosa*, *Adeorbis subcarinatus*, *Rissoa Zetlandica*, *R. calathus*, *R. fulgida*, *Skenea planorbis*, *Pleurobranchus membranacea*, and other rare shells. Wanted in exchange, any of the following:—*Trophon barvicensis*, *Natica helicoides*, *Leda caudata*, *Pholadidæ papyracea*, *Clio pyramidata*, *Aplysia depilans*, *Fusus fenestratus*, *Triton cutaceus*, *Pleurotoma striolata*, *P. nivalis*, *Jeffreysia globularis*, *Arca pectenculoides*, *Odostomia fenestratus*, *O. diaphana*, *O. minima*, *Aclis Walleri*, *A. gulsonæ*, *Velutina plicatilis*, *Ianthina exigua*, *Buccinum Humphreysianum*, *Nassa nitida*, *Cylichna nitidula*, *Vertigo Moulinsiana*, *V. pusilla*, and *Pecten niveus*. Lists exchanged; correspondence invited.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, S. Devon.

WANTED, second-hand machine for preparing slides of rocks for microscope. Exchange in fossils, rocks, shells, books, &c.—Rev. John Hawell, Ingleby Greenhow Vicarage, Northallerton.

WANTED, rock and diatom slides, trilobites, coal ferns from coal-measures, also British and foreign stamps, in exchange for rare marine, land and freshwater shells, and microscopic objects, &c.—T. E. Sclater, Bank Street, Teignmouth.

WANTED, unbound, the "Zoologist" for 1880, and for January and February, 1881. State condition and price.—Chas. Oldham, Ashton-on-Mersey.

I HAVE Meyer's "Modern Theories of Chemistry," Foster and Balfour's "Embryology," Howe's "Biological Atlas," and MacAlpine's "Zoological Atlas." Will any one give me geological literature, fossils, minerals, rock-slides, or botanical slides in exchange?—Wilmore, Trawden, Lancashire.

OFFERED, *Zonites excavatus*, *Ancylus lacustris*, *Helix pygmæa*, and many others. Wanted, *Helix nemoralis*, vars. *castanea*, *olivacea*, *roseolabiata*, *albolabiata*, *hyaloyonata*, also vars. (named) of many other land shells.—A. Hartley, 8 Cavendish Road, Idle, near Bradford, Yorkshire.

LARVÆ, pupa, and imagos of Tussur silk moth (Mylitta), and American moth (Promethea), for exchange. Wanted, exotic pupæ of imagos of moths, butterflies, or beetles.—Mark L. Sykes, Eldon Place, Patricroft, near Manchester.

WANTED, a cheap second-hand microscope, with one eye-piece; no objectives needed; rack motion and fine screw adjustment, with case. Send particulars to—Rev. A. C. Smith, Crowboro Cross, Sussex, or state requirements.

COLLECTION of British coleoptera, in four cases, on cards, first-class setting, about 200 species, four in a series. Exchange photographic apparatus, or offers.—F. Emsley, 98 West Street, Leeds.

To osteologists. Offered, jaws or beak of parrot fish (can supply part of spiny skin), also beak of albatross. Will exchange for a few exotic shells.—W. Jones, jun., 27 Mayton Street, Holloway, London, N.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Botany, a Concise Manual for Students," by Alex. Johnstone (London and Edinburgh: Young J. Pentland).—"The Medical Annual, 1891."—"The Fishes of North America," Part I.—"British Cage Birds," Part 12.—"The Spectrum," No. 2, Vol. I.—"Annual Report of Museum of American Archæology."—"Memoir and Letters of Sydney Gilchrist Thomas," by R. W. Burnie (London: John Murray).—"Plochionus and Scymnus," by I. C. Duffy.—"The Essex Naturalist," July to September.—Wesley's "Nat. Hist. and Scientific Book Circular."—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes.'—"The Microscope."—"Nature Notes."—"The Naturalist's Annual and Directory for 1891."—"Journal and Proceedings of the Royal Society of New South Wales," &c., &c.

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

THE SHELL-COLOURING OF NON-MARINE MOLLUSCA.

By WILFRED MARK WEBB, F.L.S.

THE theory brought forward by Mr. J. W. Williams* with regard to the primitive colouring of non-marine shells has already been discussed at length by Mr. S. Pace † and Mr. C. Clare Fryer, ‡ but the latter writer has brought forward some very interesting points, and Mr. Williams's § reply to the former critic calls for further remarks.

Mr. Pace gives an example of the want of clearness which he finds in Mr. Williams's writing; it can, however, be said, in favour of the latter, that authors even less lucid were quoted from, by the present writer in "The Universal Review." ‖ The meaning of the passage in question is, that "evolution of all kinds" has been from the simple to the complex. It is only necessary to bring forward the case of parasites in order to show the fallacy of such a statement, for, in many instances, although they had arrived at a stage of considerable differentiation before contracting their peculiar habits, they have since evolved in a downward direction. Mr. Williams gives it to be understood, in the concluding paragraph of his article, that he has studied Darwin's works, but in "The Origin of Species"* considerable space is given to discussing evolution "from the complex to the simple," and the following words occur :—"for natural selection, or the survival of the fittest, does not necessarily include progressive development."

* "The Colouring and Banding in Land and Freshwater Shells," SCIENCE-GOSSIP, August, 1890, p. 178.
† "The Colouring and Banding of Freshwater Shells," SCIENCE-GOSSIP, October, 1890, p. 233.
‡ "The Colouring and Banding in Land and Freshwater Shells," SCIENCE-GOSSIP, November, 1890, p. 241.
§ Ibid. SCIENCE-GOSSIP, December, 1890, p. 274.
‖ "The Zoology of the Magazines," "Universal Review," October, 1890, p. 290.

To turn now to the various paragraphs in which the facts supposed by Mr. Williams, to support his theory, are set forth :

(1.) With regard to the constitution of the primary shell :—either Mr. Pace has some authority, with which the writer is unacquainted, for saying that it consists of conchyclin, or he has taken for granted that the tissue which forms this substance in the second instance, did so in the first. Has anybody analysed the primary shell? By-the-bye, the passage quoted from Balfour's 'Embryology' in Mr. Williams's reply occurs on page 189 (not on page 229 as stated). But in quibbling over chitin and conchyclin Mr. Williams misses the crucial point of the criticism, to wit, that as the substance of the primary shell is "naturally horn-coloured" it can have no bearing, in the matter of colouring, on the calcareous pigmented secondary shell, to the animal part of which it alone can possibly be compared.

(2). Even, allowing for a moment, that no pigment occurs in the very young secondary shell, one would not expect to find significant bands developed before the animal is free-living or while it is so small that shell-markings would apparently make no difference to it.

(3.) In his first article on the subject under consideration, Mr. Williams evidently meant to say that the majority of fresh-water *Pulmonates* were "horn-coloured and bandless." With regard to his reply, it must be said that it is not the part of a sane man to require from a questioner the "proofs of his statement." It would appear, that all Mr. Pace meant by asking how "environmental conditions" could be "less in water than on land" was to point out that the application of the adjective "less" to such a

* "The Origin of Species," by Charles Darwin, F.R.S., 6th edition, p. 98.

noun as "conditions" is not good English, and that the phrase as it stands means nothing. Mr. Williams no doubt intended to convey the principle contained in the following passage from Darwin :—

"All fresh-water basins taken together make a small area, compared with that of the sea or land. Consequently the competition between fresh-water productions will have been less severe than elsewhere, new forms will have been then more slowly produced and old forms more slowly exterminated."*

(4.) Mr. Fryer's argument that white cannot be an advance in colour, is very good, and there are instances in which colour must have preceded albinism. Mr. Poulton thus speaks of the case of the albino peacock :—

"The regions in which 'structural' colours usually appear are readily recognisable, the white being of a different quality, the 'eyes' on the train coming out like a white damask table-cloth.

"Doctor Gadow informs me that the same fact is true of white ducks and drakes, the wing coverts, which are blue in normally pigmented individuals, exhibiting a peculiar sheen or gloss differing from the rest of the plumage. Doctor Gadow states that the structural colours are absent because the existence of a pigment beneath is necessary in order to show them off; and he points out that the ancestors of birds with such structural colours cannot well have been white because the effect depends in part upon pigment."†

(5.) There are in the writer's collection specimens of *Helix rufescens* in which the nucleus is of a darker brown than the rest of the shell.

Most specimens which he possesses of *Helix arbustorum*, *H. nemoralis*, *H. hortensis*, *H. aspersa* and *H. Pomatia* have a nucleus agreeing in colour with the "ground-tint" of the shell, thus in yellow, buff or brown examples of *Helix nemoralis* the apical whorl is correspondingly yellow, buff or brown.

Specimens of *Helix Pisana* from Tenby, Jersey, Guernsey and South Portugal have nuclei of a very dark brown colour, approaching black.

Of *Helix virgata*, *H. ericetorum*, *H. caperata* and *H. acuta* the nucleus is brown, corresponding in colour with the bands. White specimens of *H. Pisana*, *H. virgata* and *H. ericetorum* are also in the writer's possession which have no bands developed, but which nevertheless, retain the dark brown nucleus.

(6.) This paragraph depends on No. 4. The case of albino individuals of banded Helices is analogous to that of the white peacock which shows the "eyes" on its train, for in normal specimens of these snails the colours of the bands are accompanied by structural peculiarities in the shell, and in albino forms the areas normally pigmented are marked by transparent zones. Therefore the whiteness is not a primary but a secondary feature.

(7.) Although Mr. Williams seems to have the best of the argument with regard to the immediate derivation of *Cyclostoma elegans*, it must be pointed out that the occurrence of this shell in Pleistocene fresh-water deposits is no argument in favour of his view, for truly, terrestrial forms abound in such deposits,* that its colours no more support the theory than do those of the Helices. The *Succineæ* can hardly be called fresh-water species !

(8.) What Mr. Fryer says with regard to the colours of the *Hyalinia* and *Helices* can in every way be endorsed by the present writer, who has given his attention to the subject for some years, and hopes to soon publish his conclusions with the evidence on which they are founded.

(9.) It is very probable that bands represent coalesced spots, the stripes of mammals in several cases undoubtedly originate in this way, but some of the species which Mr. Williams mentions, such as *H. aspersa* and *H. virgata* (other snails, *Helix Pisana*, *H. acuta* and *H. vermiculata* may be added) which have bandssome times represented by dots,† have only gained this style of marking secondarily, after the bands had already been evolved, for the apparent breaking up of the bands on these shells is due to the presence of striæ which really only obscure the band underlying them. The writer has tested this by cutting sections of the shell of *Helix aspersa*, also by scraping off the prominences from the same species and from *H. vermiculata*, and has since found that, Mr. Charles Ashford calls attention to this point.‡ Mr. Ashford is perhaps one of "the few who have published their thoughts on this matter," but whose names are not given by Mr. Williams.

(10.) On taking into consideration the passage from Darwin quoted in No. 3, Mr. Williams's meaning will become clearer.

(11.) Mr. Fryer's references go to show that field-naturalists are not all of Mr. Williams's opinion with regard to the enemies of the genus *Hyalinia*. Paul Fischer, it may be noted, puts this genus with the Limacidæ not with the Helicidæ as does Mr. Pace.

The criticisms as yet offered on Mr. Williams's paper have necessarily dealt not so much with his theory as with the facts supposed to support it. That these facts have little or no bearing on the matter, is the conclusion that has been arrived at, and it is not difficult to point out the weakness of the theory itself. The manner in which the shell of the marine ancestors of the land and fresh-water molluscs was

* "The Origin of Species," by Charles Darwin, F.R.S., 6th edition, p. 83.

† "The Colours of Animals," by E. B. Poulton, F.R.S., note on p. 329.

* "The Pleistocene (Non-Marine) Mollusca of the London District," by B. B. Woodward, F.G.S., F.R.M.S., &c., "Proc. Geol. Assoc." vol. xi., No. 8 (1890).

† "Darwinism," by A. R. Wallace, LL.D., F.S.S., p. 289.

‡ "The Journal of Conchology," vol. iii., pp. 84–98.

developed must be taken into consideration. The three assertions are (α) that the shell was originally "horn-coloured;" (β) that, secondly, it was white; (γ) that bands arose as spots. The last head has been sufficiently discussed.

(α) If it be assumed that the shell was at first represented only by animal substance such as is produced in the shell-gland, it would certainly be horn-coloured—but this is arguing in a circle.

(β) If this primitive shell became calcareous it is likely that its appearance, owing to its containing little carbonate of lime, would be whitish or semi-transparent—but it would not be homologous with the secondary shell, or assuming that the secondary shell arose in this way, the white flecks which occur in the shells of *Limnæa* are at any rate more likely to be a reversion to the more completely calcified shell of their marine ancestors, than a survival of a primitive whiteness, the tenuity of the shells of the Basommatophora having been acquired apparently in their present environment.

BOTANICAL NOTES FROM KEMSING AND ITS NEIGHBOURHOOD.

BEING anxious to call the attention of those interested in the local flora of England, I have collected a few notes this last summer on the flowering plants around Kemsing, and its neighbourhood, which may prove useful to some botanist. Kemsing, a tiny rural village, nestles on the slope of a long range of chalk hills, which stretch for many miles above the villages of Otford, Kemsing, Wrotham, and others, through that part of Kent known as "the Garden of Kent." It is the district along these hills of which I particularly wish to speak. Without exception, it is the most prolific spot for wild plants with which I have ever met.

The common plants—lovers of chalky soil—such as wild marjoram, field scabious (*Knautia arvensis*), *Euphrasia officinalis*, *Scabiosa columbaria*, *Erythræa centaurium*, *Chlora perfoliata*, *Thymus serpyllum*, *Reseda lutea*, *Helianthemum vulgare* (rock rose), which emblazons the mossy banks, with its associate, *Polygala vulgaris*, etc., grow most profusely up the grassy slopes, while in the woods higher up the hill-side the sight of the great masses of *Dipsacus sylvestris*, in full bloom, and, mixed with that in the tangled underwood, thick beds of *Senecio Jacobæa*, is one really worth while going far to see.

Hypericum perforatum, *Clematis vitalba*, *Ranunculus repens*, *Reseda luteola*, *Melilotus officinalis*, *Geranium Robertianum*, *Galeopsis tetrahit*, and vast numbers of other common species in the Ranunculaceæ, Caryophyllaceæ, Umbelliferæ, Compositæ, Labiatæ, and Leguminosæ orders are found everywhere about there, in the lanes and on the hillsides.

Of the orchids I found but few, owing to the lateness of the season, but from various sources I learned that it is a rich locality for them. All I came across were *Ophrys apifera*, *Orchis pyramidalis*, *Gymnadenia conopsea*, and in the woods just above Kemsing, some splendid spikes of *Epipactis latifolia*, in full bloom. *Ophrys muscifera* abounds in June, besides most of the commoner species; *Orchis hircina* (lizard orchis), is to be met with, but is very rare.

Thanks to the kind directions of a local botanist, of Ightham, I was lucky to find some fine plants of *Atropa belladonna* in an old chalk-pit near Wrotham. The plant grows nearer Kemsing, but I failed to find the spot. The lane (Pilgrim's Road), below Beechy Lees, near Kemsing, affords fine specimens of *Trifolium fragiferum*, *Lepidium campestre*, and *Linaria vulgaris*, and farther down a lane, which crosses the railway line between Kemsing and Seal, I discovered a corner where dwelt some *Thlaspi arvense* (honesty), and *Lathyrus macrorrhizus*.

At Beechy Lees, in the lane there, are two good-sized plants of *Lithospermum officinale;* this plant grows but sparingly. A slight declivity in the hill-side near Kemsing is ablaze with masses of *Papaver somniferum*—I never saw a more luxuriant growth of them. Amongst the other lovers of the downs are *Gentiana amarella*, *Fragaria vesca*, and in the corn-fields on the range, *Anagallis arvensis*, *Valerianella dentata*, *Linaria spuria*, *Anthirrinum orontium*, and a small quantity of *Anagallis arvensis*, var. *cærulea*. Farther along we find *Nepeta cataria* (cat-mint), *Mentha arvensis*, *Spergula arvensis*, *Echium vulgare*, *Filago germanica*, and others. I saw a specimen of *Lathyrus aphaca*, just gathered on the hills, but found none myself. Space forbids of my mentioning other plants more particularly, but I would strongly urge any one, who cares for botanising, to run down and pay a visit to the Kentish hills and lanes around Kemsing on the earliest opportunity.

K. E. STYAN.

OUR LANE.

[*Continued from p.* 101.]

LIMITED space precludes me from dwelling at length upon the curious forms of insect and molluscan life that are to be found in our lane. I cannot, however, refrain from describing a creature probably unfamiliar to many naturalists. One gloriously bright day, during the past summer, I was reclining upon the close-cropped turf on the summit of the Down, when, hard by, my eye happed upon a tiny hole—about large enough to admit a small pea. Presently, some half inch adown it, I see an object slowly rising—it stops—and for some few minutes I keep my eye riveted upon it. Slowly, very slowly, again it upward moves—reaches the margin of the hole, then once again stops. So nicely adjusted in size to the orifice is the object, and so exactly does it assimilate to the earth in color, that, it is hard to believe that any hole exists. Still patiently I watch until a tiny, red velvety-jacketed spider, unsuspecting of danger, runs in a line directly across the treacherous path. In less than the twink of an eye a sharp click—spider and trap-door together disappear—and lo! in place thereof a hole is once more open to my inquisitive eye. 'Tis the burrow of the larva of that most beautiful of all English insects the tiger beetle (*Cicindela campestris*), and that nicely fitting trap-door was its flattened head, armed with a terrible pair of jaws, on which, if once impaled, no victim will ever find escape.

The larva of the tiger beetle is a remarkable instance of the adaptation of an animal to the conditions of its existence. 'Tis a curiously unattractive specimen of insectivity when exhumed, and it will at once be seen that it has been furnished with special organs fitted for the performance of special work. These consist of a pair of tubercles, situated on the upper side of the soft abdomen, to these are attached two hooks, each surrounded by a series of stiff bristles. These curious appendages enable the creature to climb up, and retain its position

Fig. 86.—*Helix aspersa.*

Fig. 87.—*Helix hispida.*

in any part of its smooth burrow, which, without some such arrangement, it would be impossible for it to do. Its flattened head, which is furnished with six eyes, not simply serves the purpose of an efficient shield, but is, also, a powerful implement, which enables its possessor to cast out with facility the excavated earth. Small pellets of sand, or loam, and particles of rock introduced into the burrow are ejected with wonderful precision and considerable force, as are, also, the exuviæ of its victims. A sharp unmistakable click is heard, and the particle is shot forth as a bomb from a mortar. When visible, gently touch the shield-like head with a slender blade of grass, the click which accompanies the lightning-like backward movement of the head indicates that the object has unerringly been struck, and the slight start of the operator almost invariably jerks the uncanny looking creature from its burrow. When the larva is about to change into the pupal condition, it securely barricades its burrow with a diaphragm of earth, and in due time emerges a beetle, resplendent in a panoply of emerald and ruby, garnished with burnished gold, but endowed with instincts little in accord with its beauteous aspect.

The burrows are numerous in the sun-scorched banks and indurated footpaths at the top of our lane.

Space will not allow of my describing many other curious forms of insect life, but winged creatures both dipterous and hymenopterous, and of "forms and hues divine," abound. Well represented are the butterflies and moths: amongst the former the least common are the beautiful brimstone (*Gonepteryx Rhamni*) and the dark-green fritillary (*Argynnis Aglaia*), but some of the most richly coloured kinds are abundant, the painted lady (*Cynthia Cardui*) and the peacock (*Vanessa Io*) particularly so; the red admiral (*Vanessa Atalanta*), I seldom light upon, whilst the commonest form in my orchard and neighbourhood is the small tortoiseshell (*V. Urticæ*). Of course the pretty orange-tip (*Anthocaris Cardamines*) is, at times, plentiful; nor must I forget that charming though by no means rare blue—the chalk-hill blue (*Polyommatus Corydon*). The speckled wood (*Lasiommata Ægeria*), the wall (*L. Megæra*), and the green hair-streak (*Thecla Rubi*), besides a host of commoner species, sport in the summer sunshine, and proclaim the richness of the locality in these "things of beauty."

Of all the many species of moths to be met with I have found the burnet to be wonderfully plentiful at

Fig. 88.—*Helix arbustorum.*

the lane-top, and the exquisite little twenty-plume (*Alucita hexadactyla*) equally abundant in my garden. All through the year—except during the coldest months—three or four to a dozen, and upwards, may always be found under the shelter of my stone, honeysuckle covered porch, very many specimens hybernating in our bedroom and dark closets.

As might be expected, the Ichneumonidæ are in full force; their name is Legion, and many and curious are their nests to be found in the neighbourhood of our lane. The mud-wasps, too, build their mud-cells in nearly every sunny crevice in the woodwork of our summer-house, in which are stored the living caterpillars which serve as food for the young grubs when hatched. Then, too, the solitary wasp (*Vespa Norvegica*) last summer hung its pretty pensile nest in a sheltered spot, o'erhung with ivy, and within but six inches of a spotted flycatcher's nest. Although in such close proximity, both creatures must have been peaceably engaged in their building operations at the same time. Several species of spiders that I have never before met with are to be found in the hedges, some I believe to be rare.

Briefly let me refer to the land shells so abundant in our lane, and woods, and fields hard by. Not far has one to seek to find a plenitude of helices. *Helix aspersa*, *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *H. virgata*, *H. ericetorum*, *H. hispida*, *H. rupestris*, *and H. lapicida* go far towards forming the nucleus of a good collection. In moist weather the smooth-barked beeches bristle with *Clausilia laminata*, and, if less abundant, *C. rugosa* (*C. nigricans*) is yet plentiful on the mossy banks and stones. *Bulimus obscurus*, too, occurs in company with *C. laminata*, and pupæ abound under fallen logs and stones. *Pupa secale*, *P. umbilicata*, *P. pygmæa* and *P. substriata* may be collected at all times, whilst a search of damp moss and stones will soon reveal *Zonites nitidulus*, *Z. radiatulus*, *Z. excavatus*, *Z. nitidus*, *Z. crystallinus*, and *Z. cellarius*. Nor will the searcher go unrewarded if he seeks for *Balea fragilis*, *Zua lubrica*, and *Azeca tridens*. Slug collectors would doubtless discover many varieties. I have once turned up in our garden *Testacella haliotoidea*.

It would be a profitless labour to enumerate a tithe of the plants which flourish in and about our lane. So diversified with hill and dale are these rich

Fig. 89.—*Helix virgata.*

woodlands, that, 'twere remarkable indeed if a wonderful variety could not be found. Not botanist enough am I to say if many great rarities may be discovered, but may yet venture to predict that the diligent collector cannot fail to add many an unfamiliar one to his store. The meadow saffron flourishes in our orchard, the lesser periwinkle (*Vinca minor*) carpets the ground over large areas beneath the trees in the beech wood at the top of our lane, where, also, I have found in abundance the bee orchis (*Orphrys apifera*), the butterfly orchis (*Habenaria bifolia*), and a host of others. The moneywort (*Lysimachia nummularia*), is fairly plentiful in some places, and if, bearing away from our lane, we descend to the lowest parts of the beech and larch woods, we shall quickly find the spurge laurel (*Daphne laureola*). A wealth of smaller plants clothe our banks with beauty.

The mistletoe (*Viscum album*) is very abundant, and is to be found growing upon apple-trees in many an old orchard hereabout. Nor is our floral display confined to the plants beneath our feet, for from the time the hazel hangs out its tasselled catkins, and the yew expands its flowers, until the late lime (*Tilia Europæa*) perfumes the air with its delicious odour, we have a succession of bloom. Haw- and blackthorns, sycamore, mountain ash, horse chestnut, ash, elm, holly, box, birch, beech and crab. Do not the orchards, too, spread out their treasures to catch the genial sun-rays? I know no greater delight than, when the pink-tipped apple-blossoms are fully expanded, to wander 'neath their flowery shade, and, meanwhile, drink in with ecstasy the sweet concert of woodland music poured from a hundred tiny throats; at such moments one feels that every sense is steeped in innocent delight, and sadly out of harmony with nature must be his soul who cannot find refreshment in communion with her in these her happiest moods.

The transition from the overshadowing beech to the humble moss, that garnishes its gnarled roots with beauty, may seem a somewhat sudden one; far less, however, than might at first appear, for are they not friends, from earliest life associate and interdependent? 'Twere needless to tell how lavishly these humble members of the vegetable kingdom have been spread o'er earth, and twig, and stone, and the muscologist will in our lane and woods find an Eldorado.

Nor will the fungologist fare less pleasantly, for a profusion of curious forms spring up on every side. Very brilliantly coloured specimens, too, are some.

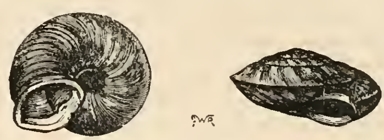

Fig. 90.—*Helix lapicidia.*

One has a bright scarlet pileus, studded with small golden knobs; this I take to be the *Amanita muscaria* of the fungologist. Many another bright-coloured "toadstool" of graceful form have I come across in my autumnal rambles through the woods; though evanescent their beauty, they yet afford the naturalist much more than a moment's joy, nor run in vain is their short-lived course.

Not yet exhausted are the attractions of our lane—nevertheless, no longer are things animate my pleasant theme. Things inert—the veriest shadows of things that were, but are no longer—these must be the subject of my closing remarks—the remains of creatures that once enjoyed their short day of life—then perished to make room for others, and leave behind a record of times remote, when man—earth's youngest born—was a creature in the far, far distant future.

Could some marvellously facile pen unfold the story of their life, 'twould be a wondrous one indeed, but we must be content to read it in the vestiges which crowd the rocks beneath our feet. Our lane and all the surrounding district is situated upon the formation known as the Upper Oolite, one rich in fossil remains, which may generally be readily extracted from the matrix. Sea urchins and pentacrinites, and univalve and bivalve shells innumerable, may be collected by the geologist, both in the quarries and road mender's stone heaps, trigonias and grypheas being exceedingly common; rhynchonellas and terebratulas occur abundantly in our garden; and when, after a heavy summer downpour, the converging water-courses pour their united streams adown our lane, it is converted into a very mountain-torrent, which sweeps all before it, leaving the rock clean swept. From this we may pick many small specimens. The collector will, however, doubtless prefer to gather his finds in the numerous quarries existing in the neighbourhood, nor need he diverge many steps from our lane to obtain the objects of his quest.

Very imperfectly hath my pleasant task been performed. I would that some more facile pen than mine had writ the story. But briefly though it hath been told, 'tis yet enough to show that within the circumscribed limits of our lane is stored materials of abiding interest, and that to record the life-history of its denizens would fully engage each busy moment of a life, e'en though its span should far exceed the allotted threescore years and ten.

Alas! the besom of so-called improvement hath ruthlessly swept away many a sweet refuge from the toils and tumult of the restless world; the joy of many a humble worshipper at Nature's shrine hath long since been translated into a pleasant memory.

Though threatened, many yet survive—long may they be preserved—and last to disappear, and leave the world less beautiful, I trust may be "Our Lane."

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. Brunetti.

[*Continued from p.* 105.]

17. *Bombylidæ.*

THE typical *Bombylidæ* are large bee-like flies, with large, globular, very pubescent abdomens, long proboscis, and long, very slender legs; their flight being very swift, feeding on nectar, and inhabiting dry warm spots in the height of summer.

The larvæ live on plant roots, or are parasitic on Lepidoptera. All the half-score or thereabouts of British species are more or less uncommon. The transformation of several species have been chronicled by Reaumur and Schaffer.

Proboscis long; antennæ contiguous at base.
 First antennal joint long: *Bombylius*, L.
 First antennal joint short: *Phthiria*, Mg.
Proboscis short; antennæ at base remote: *Anthrax*, Scop.

Anthrax paniscus, Rossi, has a somewhat oblongated black abdomen, covered with dense yellow pubescence, as is also the thorax; the wings being pale grey, the legs black, the proboscis rather short (for this family). The species basks in the sunshine; long 12 mm. *A. fenestrata*, Fln., comes from the New Forest. *A. morio*, L., a common continental species, has been reared from larvæ in the nest of a bee (*Anthophora*). I have one or two specimens of *Anthrax* in which spurious veins are present, this apparently being no uncommon thing in this genus.

Bombylius major, L., has a globular black abdomen, densely covered (and the thorax also) with pale yellow pubescence; proboscis very long; legs long, slender, black; wings clear, with the fore border marked with brown; long 9 mm.

An allied and less common species (*B. discolor*, Mik.), often mistaken for *B. medius*, L., which is a non-British species, is rather larger, and has the wings marked with numerous small circular brown spots, and appears in spring, especially on primrose.

European and exotic species of this family are very numerous, and assume large proportions and brilliant colouring.

No less than twenty-seven species, additional to the eight he admits as British, have been introduced as indigenous, according to Mr. Verrall.

B. major, L., Wlk. i. Pl. ii. 14. *A. paniscus*, Rossi, Mg., Sys. Bes. iii. Pl. xvii. 19 (*cingulata*).

18. *Therevidæ.*

Carnivorous Diptera, frequenting sandy spots; the sexes differing in the colour of the pubescence. Flight swift; larva living in the earth. Abdomen elongated; venation well marked; legs rather delicate and easily broken off. Allied to the *Asilidæ* and *Bombylidæ*, with which latter family Walker erroneously included them.

The six authenticated British species are more or less rare, *T. fulva*, Mg., being perhaps the most common. It is a black fly, with yellow bands across the abdomen, which is clothed with thin yellow pubescence, the dorsum of the thorax being bluish-grey, with two central longitudinal yellow stripes; wings greyish, tinged with yellow; legs smooth and tawny; long 9 mm.

T. nobilitata, F., is also not rare.

T. annulata, F., is easily known by its white pubescence—present in both sexes. Meigen records the larva of this species as living in rotten wood.

The genus *Thereva* is now usually split up into three, distinguished as follows:—

Under-side of face naked: *Psilocephala*, Zett.
Under-side of face hairy.
 Fourth posterior cell open: *Dialineura*, Rond.
 Fourth posterior cell closed: *Thereva*, Latr.

19. *Scenopinidæ.*

Three species of this small, natural group (only one genus being European), are British: the venation is peculiar, somewhat resembling that of the acalypterate *Muscidæ*; sluggish flies.

Scenopinus fenestralis, L., is not rare, occurring in houses, hotbeds, greenhouses, and on willows, the larva living in rotten fungi. *S. Niger*, Deg. Curt. 609 (*rugosus*).

20. *Cyrtidæ.*

This unique group, till quite recently known as the *Acroceridæ*, is also a limited and natural one, being allied to some genera of *Bombylidæ*. Small, soft, globular flies, the abdomen being apparently filled with air, splitting open with the least touch; head nearly all eye; thorax very convex; venation very indistinct, and confined principally to the upper portion of the wing; legs very short; sluggish in nature; found on tree trunks and flowers, or floating about in the breeze on calm, sunny days; long 4–5 mm.

Oncodes gibbosus, L., is selected by a species of *Crabro*, which burrows in wood, as the food for its young.

Only two genera are British, each represented by a single species.

Third longitudinal vein forked: *Paracrocera*, Mik.
Third longitudinal vein simple: *Oncodes*, Latr.

Paracrocera globulus, Pz., Wlk. Pl. i. 16.

21. *Empidæ.*

About 160 species of this extensive family are British. Their habits are very various, they frequenting woods, ditches, fields, and the banks of streams, some having the power of running over the surface of the water. Head small; body attenuated; legs long and slender; posterior femora in ♂ in some genera much enlarged.

Some inhabit the coast, a few frequent flowers, running with great swiftness over the leaves and herbage. Many species are common, some abundant, often for a few days only, and while swarming, fly backwards and forwards in streams, moving as by a common impulse.

The venation varies in the several genera; mostly carnivorous (especially the ♀, the ♂ often feeding on the juices of plants), small Diptera, and *Ephemeridæ* appearing to be their chief prey.

Westwood illustrates the larva of one or two species. Five sub-families are recognised, all being represented in Britain.

Anal cell present.
  Anterior coxæ shorter than femora.
    Proboscis long: third longitudinal vein forked: *Empinæ.*
    Proboscis short; third longitudinal vein simple.
      Anal cell longer than lower basal cell: *Hybotinæ.*
      Anal cell shorter than lower basal cell: *Ocydrominæ.*
  Anterior coxæ very prominent; as long as, or longer than, femora: *Hemerodrominæ.*
Anal cell absent: *Tachydrominæ.*

Hybotinæ.—Hybos grossipes, L., is a small shining black fly with black legs, the posterior femora being enlarged in the ♂. Flight slow; it usually hovers in swarms on summer evenings. Long $4\frac{1}{2}$ mm. *Cyrtoma*, Mg., inhabits trees and woods in summer.

Empinæ.—Empis, L. The larva and pupa live in the earth, the latter in some species being spined. About thirty species are British, appearing chiefly in the spring; the ♀ are very voracious.

E. livida, L., is a long brown fly, with three longitudinal black stripes on the thorax; long pale tawny legs, with black tips to tarsi and tibiæ, and very pale brown or quite clear wings; common; long 8–9 mm.

E. tessellata, F., is allied to the above; rather stouter and larger, legs darker brown; thorax with three black stripes; abdomen marked with a light spot in the centre of, and joined to a light posterior border to, each segment; wings brown; long 9 mm. Macquart observed one species (*O. opaca*, F.) emerge from the pupa.

Rhamphomyia, Mg., allied to *Empis*; apical transverse nervure wanting; twenty species British, their habits being similar to those of *Empis*.

Pachymeria femorata, F., is a small black fly with pale brown wings and black stigma; black legs with the two posterior pairs with dense black fringe on femora and tibiæ; long 4–5 mm.

Hilara, Mg. Many species of this extensive genus are met with on summer evenings, swarming over streams.

H. maura, F., is a small shining black fly with black legs and pale grey wings; black along the fore border and with black stigma. I could have taken ten or twelve thousand specimens of this species one day at Staines, where it swarmed over a shallow stream. It is very common; long 4 mm. The species (twenty are British) are closely allied. The anterior tarsi in many species are dilated in the ♂.

Ocydrominæ.—About six or eight species are British.

Hemerodrominæ.—Hemerodromia, Mg., inhabits grass, shrubs, and moist situations; their flight is slow; their fore-legs enlarged; long 3–5 mm.

Clinocera, Mg., a genus of slenderly-built flies, of which we have nine species; inhabits moist localities.

Tachydrominæ.—Tachydromia, Mg., an extensive genus, is represented in Britain by about thirty species, occurring in marshy situations; their movements are very agile, running swiftly over the leaves. This species are widely distributed.

H. grossipes, L., Curt. 661 (*pilipes*). *E. livida*, L., Curt. Farm insects, Pl. J. 5. *E. borealis*, L., Curt. 18. *Ragas unica*, Wlk., Wlk. iii. 3. *Clinocera stagnalis*, Hal., Wlk. iii. 6.

22. *Dolichopidæ.*

About one hundred and sixty species of this family are indigenous. Two very excellent monographs on the genus *Dolichopus*, Latr., have been published by Stannius (1831), and Staeger (1842).

The *Dolichopidæ* are rather small flies, usually of a metallic green or bronze colour, with long, spiny legs, very brittle in character. The wings are generally clear, the abdomen usually conical, shining, and shortly pubescent. Many species are common; they occur chiefly on hedges and in grass, on the stems of reeds, and plants of low growth. The abdomen at the tip curls inwards in the majority of the species.

Psilopus, a genus of delicate, long-legged flies; congregates in small groups in shady spots.

Dolichopus, Latr., found in marshy ground and long grass, in rank herbage and about overgrown pools; a few species occur on the sea-coast. Degeer has observed the transformations of *D. ungulatus*.

Dolichopus trivialis, Hal., metallic green; face above antennæ green, below whitish; antennæ black; wings pale grey; legs livid or pale yellow; tarsi black; tibiæ spiny; common; variable; long 4–5 mm.

Poecilobothrus nobilitatus, L., brilliant metallic green; under-side of thorax with silvery-grey reflections; face silvery below, green above; antennæ, which are black; legs pale yellow; tips of posterior tibiæ, and all tarsi black; wings clear; a large brown streak near the tip extending from fore to hind border; not uncommon; long 5 mm.

Diaphoris, Mg., and *Chrysotus*, Mg., very small and uncommon flies, metallic in colour, occurring on trees in the hot sunshine.

Argyra, Mcq., conspicuous by the whitish pubescence on the abdomen in some of the species; generally distributed.

Argyra diaphana, F., thorax blackish; dorsum metallic green; abdomen greenish-black; sides of first two or three segments pale yellow, and from the second segment to the tip, with whitish tomentum; face and antennæ black; wings pale grey; legs blackish-brown, tibiæ lighter; not uncommon; variable. The ground colour and markings of the abdomen resemble those of *Homalomyia caniculata*; long 6 mm.

Porphyrops, Mg., about twelve species—some not uncommon.

Hydrophonis, Whlg. This, with *Medeterus* of Fisch, are carnivorous genera (Doubleday and Macquart both record having watched them devour small insects.) The former inhabits the surface of pools; the latter frequents dry, warm localities, and is conspicuous by its bulky proboscis.

Thinophilus, Whlbg., three species; rare; sea-coast.

Scellus notatus, F., metallic bronze; sides of thorax with whitish reflections; face brown or black; whitish below antennæ; antennæ black; wings with brown streaks along the veins, and a distinct brown spot on fourth longitudinal vein near the tip; legs blackish; a few scattered spines; not rare; long 5½–6 mm.

Campsicnemus, Wlk., found in damp grass, occurring during the greater part of the year. *C. scambus* is not rare.

The following plates are good:—*Argyra leucocephala*, Wlk. i. Pl. vii. 4. *Medeterus diadema*, Wlk. i. Pl. vii. 8. *Psilopus Weidemanii*, Wlk., i. Pl. vi. 1. *Campsicnemus scambus*, Wlk., i. Pl. vi. 6. *Porphyrops elegantulus*, Curt., 541. *Scellus notatus* (*Hydrophorus*), Curt., 162.

23. *Lonchopteridæ.*

A limited group of small active flies, inhabiting grassy marshes and such like habitats, being found during the greater part of the warm weather. About half a dozen species are British, two being tolerably common, *L. lutea*, Pz., the commonest, being yellowish-brown with black antennæ and eyes, a black spot on the vertex of the head and the centre of the front of the pronotum; a brownish-black vertical stripe on the abdomen (variable); a thin central brown line on the thorax, and dark tarsi.

Lonchoptera lutea, Pz., Wlk., vol. i. Pl. viii. 1.

24. *Platypezidæ.*

All the four European genera of this family are British, representing about a dozen species, all more or less uncommon, inhabiting woods, the larvæ living in fungi.

Van Roser has published his observations on *P. boletina*, Fall., the larva of which lives in rotten mushrooms, and resembles a seed. Westwood figures it in his "Class. Ins.," vol. ii. Fig. 130–17. Walker illustrates *P. picta*, Mg., "Br. Dip." i. Pl. viii. 1, and *Callomyia elegans*, Mg., Pl. viii. 3.

Curtis gives a good plate of *Opetia lonchopteroides*, Curt., in his "Br. Ent." 489; mostly shining black flies, about 4–5 mm. long.

The genera may be recognised as follows:—

Discal cell present.
  Fourth longitudinal vein simple: *Callomyia*, Mg.
  Fourth longitudinal vein forked: *Platypeza*, Mg.
No discal cell.
  Fourth longitudinal vein simple: *Platycnema*, Lett.
  Fourth longitudinal vein forked: *Opetia*, Mg.

Platypeza picta, Wlk. i. Pl. viii. 1. *Opetia lonchopteroides*, Curt. 489.

25. *Pipunculidæ.*

Allied to both the *Platypezidæ* and *Syrphidæ* (to the latter, through the sub-family *Bacchinæ*). Three genera are European, two being British. They inhabit fields and woods, and are in the habit of hovering in the air; they are not difficult of determination, but none can be said to be common. They are larger than the *Platypezidæ*, and more stoutly built.

Discoidal cell present: *Pipunculus*, Latr.
Discoidal cell absent: *Chalarus*, Wlk.

Pipunculus pratorum, Fall., Curt. 757. *Chalarus spurius*, Fall., "Br. Dip." i. Pl. viii. 7.

26. *Syrphidæ.*

This extensive and well-known group is divided into several sub-families, and represented in Britain by over 200 species (about 1100 species are European).

As a rule the species of this family are flat-bodied, brightly coloured insects (usually more or less yellow and black), many resembling wasps; and they are popularly known as drone flies or sun-flies, from their habit of hovering in the sun over flowers, emitting meanwhile a shrill hum; their movements on the wing are very rapid, and, so to speak, spasmodic.

The larvæ feed on a variety of substances, some on decaying vegetable matter, these being thus of considerable assistance to agriculturists, the flies being so abundant.

Schiner divides the *Syrphidæ* into eight sub-families: *Syrphinæ*, *Volucellinæ*, *Sericomyinæ*, *Eristalinæ*, *Milesinæ*, *Chrysotoxinæ*, *Microdoninæ*, *Cerinæ*; but Verrall neither recognises sub-families in his list, nor adheres to the German author's sequence of families.

The *Pipiza* group of genera seem to me appropriately placed next the *Pipunculidæ*, and the *Cerinæ* undoubtedly approach the *Conopidæ*, which latter family form a useful intermediate group to connect the divisions of Macquart's *Tetrachætæ* and *Dichætæ*.

The principal genera may be tabulated thus:—

Marginal cell closed.
Antennæ plumose: *Volucella*, Geoff.
Antennæ with a bristle: *Eristalis*, Latr.
Marginal cell open.
Posterior femora thickened.
Third longitudinal vein straight.
Fourth longitudinal, before its junction with third, bent into two loops.
Fourth longitudinal at second loop bent back to the third: *Eumerus*, Mg.
Fourth longitudinal at second loop carried forwards to the third: *Syritta*, St. Farg.
Fourth longitudinal vein, from the portion bent up to its junction with third, nearly straight, and more or less in a straight line with the bent-up portion of the fifth.
Eyes bare.
Abdomen conical or rounded.
Arista bare: *Criorhina*, Mcq.
Arista plumose: *Sericomyia*, Mg.
Abdomen elongated: *Xylota*, Mg.
Eyes hairy: *Pipiza*, Fall.
Third longitudinal vein strongly looped downwards into first posterior cell: *Helophilus*, Mg.
Posterior femora normal.
Antennæ elongated—longer than head—horizontal: *Chrysotoxum*, Mg.
Antennæ normal—shorter than head—deflexed.
Abdomen much retracted at basal segments: *Baccha*, F.
Abdomen barely or not retracted at base.
Eyes pubescent; wings spotted.
Abdomen golden yellow: *Chrysochlamys*, Rond.
Abdomen blackish blue: *Leucozona*, Sch.
Eyes bare; wings never marked.
Species yellow and black.
Abdomen elongated—longer than wings: *Sphærophoria*, St. Farg.
Abdomen oblong or oval—shorter than wings.
Anterior tibiæ in ♂ dilated; abdomen oblong: *Platychirus*, St. Farg.
Anterior tibiæ never dilated; abdomen oval: *Syrphus*,, F.
Species black or greenish-black.
Front rough or furrowed: *Chrysogaster*, Mg.
Front smooth: *Chilosia*, Mg.

Syrphus, F. This, the commonest genus, is represented by about thirty-five rather closely allied species, all more or less resembling wasps. Abdomen bright yellow, with transverse black stripes; thorax yellowish, greyish, or livid; legs thin, yellow with black rings; wings usually clear; long about 7–9 mm. The commonest species are *S. ribesii*, L., *corollæ*, F., *pyrastri*, L.; larva figured by Westwood, Class, Ins. ii. Fig. 130–21. *Balteatus*, Deg., Bouché has observed the metamorphoses of this species, and *luniger*, Mg. The larvæ of this genus feed on *Aphidæ*.

Platychirus, St. Farg., an allied genus of about twelve British species, has a narrower abdomen, several species being common; about the length of, and closely resembling *Syrphus*. The venation in *Syrphus*, *Platychirus*, *Chilosia*, and *Melanostoma* is very similar. Mr. Verrall, in the "Ent. Mon. Mag.," gives some excellent notes on the British species of *Platychirus*.

Chilosia, Mg., a rather large genus of black flies, more or less pubescent, rather stoutly built; wings never marked, and generally grey or brown. Chiefly found in woods and meadows, and most of the species are more or less local; long about 8–10 mm. A continental authority (Professor F. Kowarz) has recently revised the majority of the European species.

Rhingia rostrata, L., a characteristic species; tawny brown, with a black head and thorax; tawny face produced in the form of a strong, long, pointed snout; wings pale grey; legs tawny; proboscis long and horny; common; long 7–8 mm. Reaumur found the larva in cow-dung.

Eristalis, Latr.—These are the typical "drone flies," several species being very common, the larvæ living in stagnant water.

E. tenax, L., is a brown fly, with grey or pale tawny marks on the abdomen; face clothed with short, pale yellow pubescence, with a strong, broad, central black line; legs brown, paler at the knees and tips; wings clear, or slightly brown at the base, fore-border, and towards the tip; thorax clothed with short thick tawny brown pubescence; abdomen very variable in colour, sometimes entirely black; very common everywhere; long 10–12 mm.

I once placed a live ♂ in a glass-top box with a dead ♀ and it remained in côp. for about half an hour.

E. intricarius, L., abdomen thickly clothed with black hair, tip with whitish hair; base of the tibiæ pale yellow; wings clear; scutellum surrounded by thick yellow hair; thorax clothed with black hair; rather smaller, less common, and more local than *tenax*. The colour of the pubescence varies greatly, being sometimes nearly all yellow, or with a reddish tinge; long 8–9 mm.

E. arbustorum, L., a very common species, smaller than *intricarius*; abdomen bare, tawny with, roughly speaking, two black triangular spots on it, their apices nearly touching; legs black and yellow; wings clear; thorax with greyish yellow pubesence; face with yellowish white hair; frontal stripe in ♀ black; long 8 mm.; very common everywhere; variable.

Volucella bombylans, L., a large bee-like fly covered with thick pubescence, which is yellow on the thorax, black at base of the abdomen, and whitish or reddish at the tip, and two yellow tufts of pubescence at the sides of the base of the abdomen; under side of thorax with thick black hair; face with yellow hair, and in ♀ with a central stripe of thick yellow hair; legs black; wings pale grey, brownish tinged along the fore border; very variable. There are two distinct varieties, both of which Miss E. Ormerod has bred from one batch of eggs; and Mr. Verrall possesses a series, showing every form of intermediate colouring; common; long 9–11 mm.

V. pellucens, L., a large black fly; bare; basal half of abdomen livid; legs black; wings nearly clear, with a large irregular blackish spot in the centre of the fore border, extending downwards half way across the wing; face yellow; slightly smaller than *bombylans*; common.

Helophilus pendulus, L., a yellow fly; bare; top of thorax black, with four yellow stripes; abdomen with transverse black markings; face yellow, with a central black line; legs black and yellow; posterior femora enlarged; wings clear; rather common; long 9–10.

Several other species of *Helophilus* are more or less common in Britain; mostly yellowish in colour, and allied to *pendulus*; known as "sun-flies," their habits being similar to those of *Eristalis*.

Xylota segnis, L.—Black, basal half of abdomen dull red; face with short whitish pubescence; legs black, with base of tibiæ yellow; wings grey or pale brown; posterior femora enlarged; long 8–9 mm. About six species of *Xylota* are British. The larva of *Xylota* lives in decayed wood,

Syritta pipiens, L., is a small and very common insect found everywhere, London included. Black, with the under side grey; face with thick greyish white pubescence, a small yellowish spot at each edge of posterior borders of the abdominal segments; legs black, marked with tawny or yellow; posterior femora much enlarged; wings quite clear; variable in size and markings. Larva lives in horse-dung; long 5–7 mm.

Criorhina oxyacanthæ, Mg., resembles a bee; covered with yellow pubescence, deepest in colour on the thorax; face much produced; black, covered on upper side with thick yellow hair; legs all black or dark brown; wings pale grey, yellowish at the base, and with a black stripe extending half way across the wing from the centre of the fore border. The larva lives in river bank mud; long 12–13 mm.

Eumerus, Mg., a genus allied to *Syritta*, is represented by three species.

Chrysogaster, Mg., is a genus of metallic, dark, greenish-black flies, with rather dark wings; black legs, short pubescence; several species, all closely allied, are British; one of their characteristics is the grooved face; they appear chiefly in spring and summer on *Ranunculi*; long 6–7 mm.

Chrysotoxum, Mg.—Seven species are British. A genus of large, handsome, wasp-like flies, except that the base of the abdomen is not contracted; thorax black, with yellow side markings; face black, generally with a wide central black line; abdomen oval, convex, yellow with transverse black markings; legs thin, principally yellow; wings unmarked, greyish; base tawny yellow; long 10–12 mm. Larva feeds on plant roots.

The *Syrphidæ* occasionally swarm in countless numbers, when several species are sometimes found forming part of the host. At Margate, in August, 1869, the following appeared in vast profusion during one day:—*E. tenax*, *S. balteatus*, and *Sphærophoria tæniatus*.

Swammerdam and Reaumur have studied and illustrated their writings on the life-histories of several common species.

Over a thousand species are European. *Sphegina clunipes*, Fln., Wlk. i. Pl. x. 16. *Syrphus pyrastri*, L., Wlk. i. Pl. x. 12. *Leucozona lucorum*, L., Curt. 753. *Rhingia campestris*, L., Curt. 182. *Volucella inflata*, F., Curt. 452. *Sericomyia borealis*, Fln., Walk. Pl. ix. 14. *Syritta pipiens*, L., Wlk. Pl. ix. 9. *Criorhina oxyacanthæ*, Mg., Wlk. Pl. ix. 12. *Chrysotoxum bimaculatum*, Curt. 853.

27. *Conopidæ*.

This group is a small one, allied to both the *Syrphidæ* and higher forms of *Muscidæ*. The species in the first division closely resemble wasps (*Odynerus*, &c.); the larvæ are parasitic on bees, Latreille having reared *P. rufipes* from living *Bombidæ*, whilst Westwood noted the abundance of *O. atra* on sand-banks in which several species of bees burrowed.

One or two authors have greatly multiplied both genera and species, nearly all their names being now sunk as synonyms. The eyes are wide apart in both sexes, the ♀ being distinguished by a ventral horny process towards the end of the abdomen.

None of the species can be said to be common.

Antennæ stylate; ocelli absent (*Conopinæ*).
- First abdominal joint of normal width: *Conops*, L.
- First and second abdominal joint much retracted: *Physocephala*, Sch.

Antennæ with a bristle; ocelli present (*Myopinæ*).
- Proboscis bent only at the base: *Zodion*, Latr.
- Proboscis bent at the base and at the middle.
  - Face much produced downwards below the eyes; proboscis short: *Myopa*, F.
  - Face not much produced downwards below the eyes; proboscis long: *Oncomyia*.

Conopinæ.—*Conops flavipes*, L., is black and yellow; face yellow, with a central black stripe; antennæ black; thorax black, with yellow spots on shoulders; abdomen black, with two (♀) or three (♂) yellow bands; legs yellow and black; wings greyish; fore border brownish; long 10 mm. This is the most common species of the genus.

Phyrocephala rufipes, F.—*Phyrocephala* is distinguished from *Conops* by the first and second abdominal segment being much contracted; the legs are thinner, and have frequently a twisted appearance. The colour of *P. rufipes* is brownish red; face yellowish, with a black central stripe; antennæ black; legs tawny brown, marked with black; wings pale grey, anterior portion pale brown almost to the tip; tip of abdomen covered with thin silvery-grey tomentum, and it varies in colour; long 10 mm.

Myopinæ.—Sicus ferrugineus, Scop.; rather common and widely distributed. Uniformly tawny; face broad—reddish-yellow; wings pale grey, tinged with tawny; long 6–8 mm.

Myopa testacea, L., is tawny; dorsum of thorax black, with greyish reflections; wings pale tawny grey; internal transverse vein clouded; under side of face white; pubescent; rather common, and generally distributed; long 5–7 mm.

M. buccata, L., an allied and rather common species, has pale brownish marks on the wings, giving them a mottled appearance, and the transverse veins are not distinctly clouded. *Stomoxys*, a genus of *Muscidæ*, has erroneously been included in this family.

Conops flavipes, L., Panz. lxx. 21. *Physocephala rufipes*, F., Wlk. i. Pl. x. 18.

28. *Œstridæ.*

The *Œstridæ* form a small but very interesting group, represented by eight British species. In the imago the mouth is obsolete, the venation more or less obscurely defined, and the alulæ large; eyes widely separated in both sexes. In the larval state they are parasitic, each species living on or in a different animal, the larva dropping to the earth when fully developed, and pupating in the ground.

In *Gastrophilus equi*, F., the ♀ lays her eggs in the mâne of the horse, and on the animal licking it, the eggs pass into the stomach, where the larvæ emerge and develop, afterwards passing out with the dung, and pupating in the earth. The imago is a brown fly, with yellow and brown pubescence; the face is covered with yellow pubescence; the legs are thin, yellow, somewhat short; the wings grey, with a dull brown stripe in the centre; the abdomen has yellowish pubescence. Long 11–12 mm.

Oestris ovis, L. The ♀ lays her eggs on the nose of the sheep, the larvæ crawling thence into the head, where they attain their full size, afterwards descending the nostril, and assuming the pupa state in the ground.

It is a brownish-grey fly, with clear wings, large white alulæ, and yellowish-brown legs; long 9–10 mm. When attacked, the sheep cluster in a circle, holding their noses together close to the ground.

Hypoderma bovis, Deg., is parasitic on cattle, laying its eggs in the back, a tumour arising, from which when full grown the larvæ emerge. Black, pubescent; tip of abdomen with red pubescence; face and under side with grey pubescence; legs black; wings brown; long 12–14 mm.

One or two other species are British, but are very rare. Clark's essay on "Bots" is a splendid monograph, splendidly illustrated. It is impossible to breed the flies, as the larvæ die on removal from its host. They are very swift on the wing; the larvæ are popularly known as "warbles," and the perfect insects as "bot-flies."

ROSSENDALE RHIZOPODS.

No. 3.

I NOW come to a genus of testaceous Rhizopods, viz., Difflugia, so common, and so widely distributed, that every microscopist is more or less familiar with their arenaceous, box-like shells. Every pond, ditch, and bog is sure to furnish one or more species of this ubiquitous genus, if the sediment be carefully examined; and it is somewhat comical to see the box-like shells, especially the taller species, bobbing about among the Algæ and broken-down organic detritus. The genus contains about twelve species—differences in form of shell or test, and in the character of the mouth, separating them. These species, however, are often connected by intermediate forms, and it is sometimes very difficult, and more rarely impossible, at the time, to say definitely to which species a given specimen may belong, as it may possess the characters of at least two species, in fairly-balanced proportions. They present themselves

Fig. 91.—*Difflugia pyriformis.*

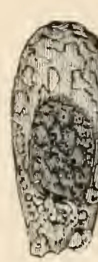

Fig. 92.—*D. pyriformis.*

as round, oval, pyriform, or in other ways elongated, box-like shells, made up of large and small sand-grains and diatom frustules (chiefly of the linear kind), separately or mixed in various proportions; in more than one species it is of chitinoid membrane, and especially is this the case in the forms from Sphagnum. Indeed, I believe that in all the species there is a chitinoid basis, even in those species in which nothing but sand-grains can be seen. They vary greatly in form and size, not only among themselves, but in the same species. I have seen a *D. acuminata* as large as the $\frac{1}{25}$ of an inch in height; other and rounder species are as small as the $\frac{1}{400}$ of an inch in diameter; but from $\frac{1}{100}$ to $\frac{1}{200}$ of an inch may be considered as ordinary dimensions. The sarcode is occasionally coloured, more commonly green, and often deeply so, but is more generally, in my experience, colourless, except as may be modified by the presence of food, and it usually entirely fills the shell. The pseudopodia are not, as a rule, numerous, rarely more than five or six, and are long, and finger-like. It is not every specimen, however, in which the pseudopodia can be seen projected, but when this is the case they will be found to lengthen or shorten, or slowly to move from side to side, almost continuously, while under observation. The mouth of the test is in most cases inferior and terminal. During the past three months I have found numerous individuals of the genus, belonging to three species.

Difflugia pyriformis is perhaps the commonest species of the genus, and varies greatly in size and shape. The typical form is narrowly or broadly pear-shaped, hence the name; other varieties are ovoid and flask-shaped; occasionally this is compressed, and in one well-marked variety the top or fundus of the shell has one or two pointed, conical processes. In some the sand-grains are large, rough and angular, in others most minute; while other forms have the large and small mixed in varying proportions. One common form here has its test of colourless chitinoid membrane, with a few widely-scattered sand-grains and diatoms. The pseudopodia are, in this species, finely granular, and and in all my specimens free from colour.

Fig. 91, the prevailing form here, of chitinoid membrane, with widely-scattered sand-grains and diatoms. Empty. Fig. 92, another similar one, with sarcode encysted in a brownish ball. Fig. 93 large form, test composed entirely of sand-grains.

Fig. 93.—*Difflugia pyriformis.*

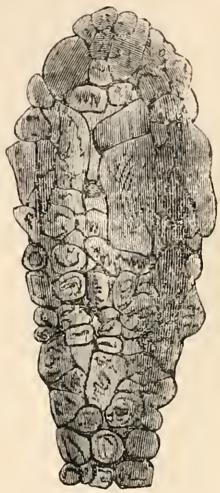

Fig. 94.—*Difflugia pyriformis.*

Fig. 95.—*Difflugia globulosa.*

Fig. 96.—*D. globulosa.*

Fig. 97.—*D. globulosa.*

Fig. 98.—*D. globulosa.*

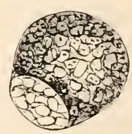

Fig. 99.—*D. globulosa.*

Fig. 103.—*D. acuminata.* Sand-grains with considerable space between, which is filled up with dark brown chitine.

Fig. 102.—*D. acuminata.* Baloon-shaped individual, with rounded prolongation.

Fig. 100.—*D. acuminata.*

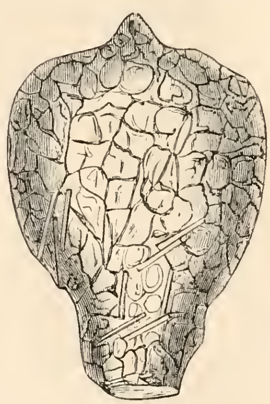

Fig. 101.—*D. acuminata.*

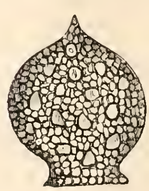

Fig. 104.—*D. urceolata.*

Fig. 105.—*Difflugia pyriformis.* Specimen with straw-coloured chitinoid basis, sand-grains rough. In form, it seems to connect this species with *D. globulosa.* This variety has been discovered since the foregoing was written.

Pseudopodia extended. Fig. 94, very fine specimen from Sphagnum; test of extra large and rough sand-grains. Size $\frac{1}{30}$ of an inch. *Difflugia globulosa* is another common form, one of the smallest of the genus. It was one of the first to be described and figured, and is probably the *D. proteiformis* of the illustrious Ehrenberg. Its general form is that of a round or oval box, more or less truncated at the mouth. One common variety has exactly the form of the 'box' of the sea urchin (Echinus). In the character of the materials used in the formation of the test, and in other particulars, it differs little from the preceding. I occasionally come across a form in several of our shaded wells and clear pools, which has a large, eccentric mouth, like *D. constricta*, or the spineless form of *Contropyxa aculeata*. As it is too low for the former, and is wanting in the appendages to the incurved mouth of the latter, it more properly, I think, may be placed here. Size from $\frac{1}{200}$ to $\frac{1}{300}$ of an inch.

Fig. 95. Empty test, made up of minute sand-grains; ventral view.

Fig. 96 of chitinoid membrane, with scattered large sand-grains. Side view, pseudopodia extended.

Fig. 97. This form might, with almost equal propriety, be classed with *D. constricta*, or even with *Centropyxis ecornis*, as the mouth is eccentric, and the highest part of the shell behind the mouth; but it appears to me, for reasons given above, to have a greater affinity to the present species.

Fig. 98. Side view of specimen with closely-packed sand-grains.

Fig. 99. The same, rolled over to show the mouth of the shell.

Difflugia acuminata is also an equally common form here, and I procure it in considerable numbers from among Sphagnum in boggy places, and in most of our shady wells and clear pools. The prevailing form is shown in Fig. 100. The species may be described as pyriformis, drawn out to a point at the top (fundus).

The test is oblong oval, in the typical form, narrowing towards the mouth, and more or less suddenly tapering towards the summit, in varying degrees of acuteness. Although this species is as variable as any in the genus, I have only as yet found two well-marked varieties, during the three months I have been specially studying the Rhizopods. Like the preceding species, the test is made up of sand-grains, occasionally intermixed with the frustules of diatoms, or it is obviously of chitinous membrane, either colourless or yellow, more or less incrusted with the above elements, sometimes very irregularly so. Size from $\frac{1}{25}$ to $\frac{1}{150}$ of an inch. Sarcode rarely coloured.

Fig. 100. The prevailing form in this district, of colourless chitinoid membrane, with scattered sand-grains and diatoms. Pseudopodia extended.

Fig. 101. Large specimen, from shaded well, test of yellow, wrinkled chitine, with large sand-grains and a few linear diatoms. The sand and diatoms do not project much, but are apparently sunk in the membrane, and so partake of its yellow colour. In my next I shall treat of the box-like Centropyxis, and the genus Arcella. The latter is one of the commonest forms of the Rhizopods, and is the one most frequently noticed by microscopists who do not make a special study of the class.

Difflugia urceolata is a large variable form closely related to *D. acuminata*. The shell is somewhat ovate, amphora-like; fundus either evenly rounded or more or less acute, frequently furnished with blunt spines. Neck short; mouth large and round, occasionally with a reflected rim.

This handsome species is of rare occurrence in this district, and when I do find a specimen it has generally been an isolated one. My specimen has an acute fundus, and the neck is only slightly reflected. Size about $\frac{1}{150}$ inch. The test is of sand grains—a few large ones, regularly distributed, the intervals filled up with smaller ones of nearly equal size (Fig. 104).

J. E. LORD.

Rawtenstall.

NOTES ON NEW BOOKS.

MEMOIR OF SIDNEY GILCHRIST THOMAS, by R. W. Burnie (London: John Murray). This is altogether a noble, bright, and cheerful book—the pleasant record of a brilliant young life. The "Thoman-Gilchrist" process, by which formerly half-worthless iron ore is converted into good stuff, by having its phosphorus extracted, whilst the latter in its turn is utilised as artificial manure—is already well-known to most of our readers. Only thirteen years ago there was not in existence any public record of the successful dephosphorisation of pig-iron—last year there were 2,603,083 tons produced. In addition, last year there were placed on the market, to be used as artificial manure—stones that science has converted into bread—no fewer than 623,000 tons of basic slag. This wonderful success in metallurgy was due almost solely to the patience and unwearying industry of Sidney Gilchrist Thomas, and yet he died (of overwork, it is to be feared) at the early age of thirty-four. By that time he had come to be acknowledged as the most brilliant metallurgist of the century. Honours from all countries were showered thickly upon him. And yet this scientist left school at seventeen to be a school-teacher. At eighteen he was clerk in a London Police Court, an office he held for twelve years. He studied chemistry, mineralogy, geology, &c., on what leisure evenings he had, and conducted his experiments and investigations then and during his holidays. He made his valuable discovery whilst still a clerk at the Thames Police Court. Within the brief period of a twelvemonth we find him a clerk, and then the acknowledged leading metallurgist of his day. It is a wonderful story of what a young man can do, and Mr. Burnie has told it well in this handsome volume.

Coal, and what we get from it, by Professor R. Meldola (London: S.P.C.K.). This is perhaps the most interesting of the volumes yet issued under the title of "The Romance of Science." It is a much-expanded issue of a Lecture delivered by Professor Meldola at the London Institution, and both to the student and the general reader it is a highly-valuable, clear, and concise account of the now-important coal-tar industry. All the valuable materials here explained not many years ago were worse than wasted. Science has reduced them, and turned them to use. About three hundred coal-tar colouring-matters are now made, and thirty of these are in economic use, all of them fast dyes. There are thirty more fast enough for all practical requirements. The value of the coal-tar colouring-matters annually produced in Great Britain and on the Continent is five millions sterling. From the same original source are also derived such explosives as picric acid, medicines such as antypyrin, sweets such as saccharin, and perfumes resembling vanilla, bitter almonds, &c., to say nothing of the hydroquinin and eikeneogen used by photographers and others. Professor Meldola's book is a genuine "Romance," far transcending in interest and plot three-fourths of the so-called "novels" of the day. It is a book that will be largely read and highly-prized.

Colour Measurement and Mixture, by Captain Abney (London: S.P.C.K.). This is another of the same half-crown series—all of which are written by the chief recognised authorities on each subject. Whatever Captain Abney has to say on the matters here discussed is sure to be listened to. There are few appeals from his conclusions, especially when they concern the physics and chemistry of photography. Students will here find worked-out the heating, luminous, and chemical effects of the spectrum. The work contains sixteen chapters, devoted largely to colours, their origin, effects, combinations, &c., and is abundantly illustrated where necessary to a fuller understanding of the text.

The Missouri Botanic Garden. This institution was founded by the late Mr. Henry Shaw, of whom a lengthy biographical sketch is given. Professor Trelease's "Inaugural Address," and a "Flower Sermon," together with the First Annual Report, are included in this nicely got-up volume. It is well illustrated. Mr. Shaw must have been a very sociable fellow, for he left money for an annual banquet. Accordingly we have the report of that also, at which banquet one hundred guests were present.

Fifth Report of the United States Entomological Commission on Insects injurious to Forest and Shade Trees, by A. S. Packard (Washington: Government Office). This is a neatly got-up volume of a thousand pages, illustrated by forty plates, and upwards of three hundred woodcuts. The papers are strictly scientific and thoroughly practical. Hence their high economic value. They deal with the various insects injurious to the oak, elm, hickory, butter-nut, locust-tree, maple, cotton-wood, poplar, lime, birch, beech, wild cherry, wild plum, thorn, crab-apple, mountain ash, willow, hackberry, sycamore, pine, spruce, fir, hemlock, larch, juniper, cedar, cypress, &c., with full descriptions of the habits of their insect enemies, and advice how to cope with them.

Annual Report of the Fruit-Growing Association and Entomological Society of Ontario, 1890 (Toronto). This volume is the twenty-second annual report of a most useful society. It is full of capital practical papers on many matters concerning peaches, pears, prunes, cherries, apples, grapes, &c., their growth, decay, enemies (animal and vegetable). Horticulturists all over the world will be interested in this useful volume, which it is a great pity to have spoiled by the wretched photograph of the President as frontispiece.

Zoological Articles contributed to the "Encyclopædia Britannica," by Professor E. Ray Lankester, &c. (London: A. & C. Black). All earnest students of advanced zoology are already aware that the last edition of the "Encyclopædia Britannica" contains some of the most exhaustive articles on special subjects connected with their science which have yet been published. They are not likely to be excelled for some time to come, and that ponderous but useful work would therefore have had to be consulted, the papers picked out of its many volumes, and much time have been lost, if Professor Lankester and the publishers had not hit upon the happy thought of issuing the present volume at such a price that it comes within pocketable reach of most students, and lies in such a handy and compact form, both for careful study and reference, that few naturalists or general libraries can do without it. The illustrations are numerous, and one or two important additions have been made to them over and above those in the original work. The text, also, has been corrected and slightly added to where necessary and convenient. On the various papers themselves it is not necessary to make any remarks. Their high-class character practically places them beyond the reach of criticism. All Professor Lankester's articles are here reprinted—on "Protozoa, Hydrozoa, Mollusca, Polyzoa, and Vertebrata." In addition we have the following papers, by permission of the authors—"Sponges," by Professor Sollas; "Planarians," by Professor von Graff: "Nemertines," by Professor Hubrecht; "Rotifera," by Professor Bourne; and on "Tunicata," by Professor Herdmann.

Telescopic Work for Starlight Evenings, by

W. F. Denning (London: Taylor and Francis). Astronomical students and amateurs of the science are numerous, and they are not unprovided with manuals and other guides. But we doubt if we possess any which so fully meets their wants as the book before us. Its author is an enthusiastic amateur astronomer, who has contributed for many years past much valuable original work to the science to which he is devoted. A completer working manual of astronomy than this, his last-issued work, it is difficult to conceive. It is full, clear, accurate, and yet popular. Many of the chapters have appeared as special papers contributed to scientific magazines, where some of our readers must have met with them. The chapters are as follows:—"The Telescope, its Invention, and the Development of its Powers," "Relative Merits of Small and Large Telescopes," "Notes on Telescopes and their Accessories," "Notes on Telescopic Work," "The Sun," "The Moon," "Mercury," "Venus," "Mars," "The Planetoids," "Jupiter," "Saturn," "Uranus and Neptune," "Comets and Comet-Seeking," "Meteors and Meteoric Observations," "The Stars," "Nebulæ and Clusters of Stars," &c. The illustrations are sixty-four in number, and all are of a high-class character. Paper, type, and binding altogether make up a handsome and pleasant-looking volume.

Geologists' Association—A Record of Excursions made between 1860 *and* 1890, edited by T. V. Holmes and C. D. Sherborn (London: Ed. Stanford). We have frequently thought, when we have received the pithily explained and well-illustrated pamphlets sent out to members describing the places to be visited at each excursion, what a pity it was they were not collected in a more permanent form. Each account is written by a local specialist, and each diagram and illustration is the most interesting in the district. All England and Wales have thus been visited by members of the Geologists' Association during the last thirty years. Therefore we are unexpectedly pleased to welcome the present volume, which is just the very thing we have so long thought ought to be done. By its very nature, it must be the very best field-manual of British geology yet issued. Between two and three thousand places are referred to in the index, and there are 214 maps and sections. Every student of field-geology should forthwith procure this useful work, which has been excellently edited by Messrs. T. V. Holmes and C. D. Sherborn.

A SCIENTIFIC PLAINT.

ALAS, those happy days which we have seen
 When thou, whose fickleness I now deplore
Wert like to concentrated saccharine;
 Those happy days can come to us no more,
When ardent love is strong as $H_2 SO_4$.

Thou, like blue litmus in the acid test,
 Whene'er we met, wouldst turn to rosy red,
And when my love undying I confessed,
 Thy words were sweet as acetate of lead;
Now truly are they changed to vitriol instead.

For, turning to analysis improper,
 A quantitative test was made for gold,
And when but little else there seemed than copper
 And scanty silver in the cash I hold,
Thy love grew straightway like a freezing-mixture cold.

Entirely siliceous was thy heart;
 Thy love was gone. The sequel need I tell?
Betrothed unto another now thou art,
 Like to the atom H we know so well,
Which leaves its own O_2 to join the base Cl!

A. C. DEANE.

THE GEOLOGICAL HISTORY OF THE THAMES VALLEY.

By Dr. A. IRVING, F.G.S., &c., Wellington Coll.

[*Continued from p.* 112.]

THE GLACIAL PERIOD AND SINCE.

THE probability that England was united with the continent of Europe during Miocene, Pliocene, and Quaternary times, has long been recognised by some of our leading geologists. The sea not having cut its way as yet through the Quaternary isthmus to form the present Strait of Dover, the great glaciers of Scandinavia on the one hand, and of Northern Britain on the other, seem to have formed by their confluence a mighty dam, which ponded back the waters of a vast drainage-area of Central Europe and Southern Britain. This, at least, from a consideration of all the evidence on the one side and on the other, would appear to have been a most important factor in the glaciation of Central and Southern England. The facts inductively arrived at have been well represented by the late Professor Carvill Lewis of Philadelphia, on a map, which was printed for Section C of the British Association, when it met at Manchester in 1887. The moraines have been taken as indications of the boundary of the great northern ice-sheet; and the extra-morainic lake, which then covered most of the Midland and Eastern Counties, overflowed by the Upper Avon line of drainage into the Severn Valley, and by the Oxford Basin and the Pangbourne Gap into the Thames Valley. Much work was done, no doubt, by the ice which floated down this narrow channel to widen and deepen it. Professor Prestwich* assigns a deepening of the gorge to the extent of some 220 feet to glacial action. This is probably an excessive

* "Journal Geol. Soc.," vol. xlvi., p. 149.

estimate, for two reasons. (1) The plateau-gravels, which cap the adjacent hills, and which he assigns (as equivalents in time of his Mundesley and Westleton Beds) to the beginning of the Quaternary period, may be merely terrestrial deposits of the Pliocene Mercian river-system, and more nearly equivalent in time to the plateau-gravels of Berks and West Surrey, being certainly older than the present Chalk escarpment; (2) the extent to which the gorge has since been cut down to its present level, appears, from still more recently-published observations to be greater than he has estimated.* We may, perhaps, deduct 100 feet at least from his estimated 220 feet, as the vertical measurement of the work of erosion during the Glacial Period.

Professor Carvill Lewis estimated that the waters of the above-named extra-morainic lake stood some 250 feet above the present sea-level in the old Thames Straits of the Glacial Period. Now it is a remarkable fact that at very near this elevation—that is to say, at levels varying from 220 to 240 feet—the author has, within the last year or two, made a considerable number of observations of glacial action in East Berks. The laminated clays are highly contorted, and great masses of sand and gravel, weighing in some cases many tons apiece, have been driven bodily, in a solid (frozen) state,† into the clays, the lamination of which is maintained in a most remarkable manner through the contortions of the strata. Examples may be seen in the railway-cuttings at Wokingham and Sunninghill, on the South-Western Railway; but the finest by far have been lately brought to light in the excavations in the brick-yard of Messrs. T. Lawrence & Sons, close to the Nine-mile Ride in Old Windsor Forest.* Some of the best of these are gone for ever, as the pits have been extended; but, fortunately for science, photographs were secured by members of the photographic section which has been recently started by the Natural History Society of Wellington College. One of them, it is hoped, will be reproduced for publication by the Geologists' Association of London. Subjoined is a later photograph of a section, now also obliterated, and only exposed to open daylight for a few days in March, 1891. (See Fig. 106.) It was taken by one of the author's pupils, Mr. McClintock, of Wellington College. Copies of the earlier photographs were exhibited at the lecture, and some of them have found their way to the Woodwardian Museum at Cambridge, and to the British Association.

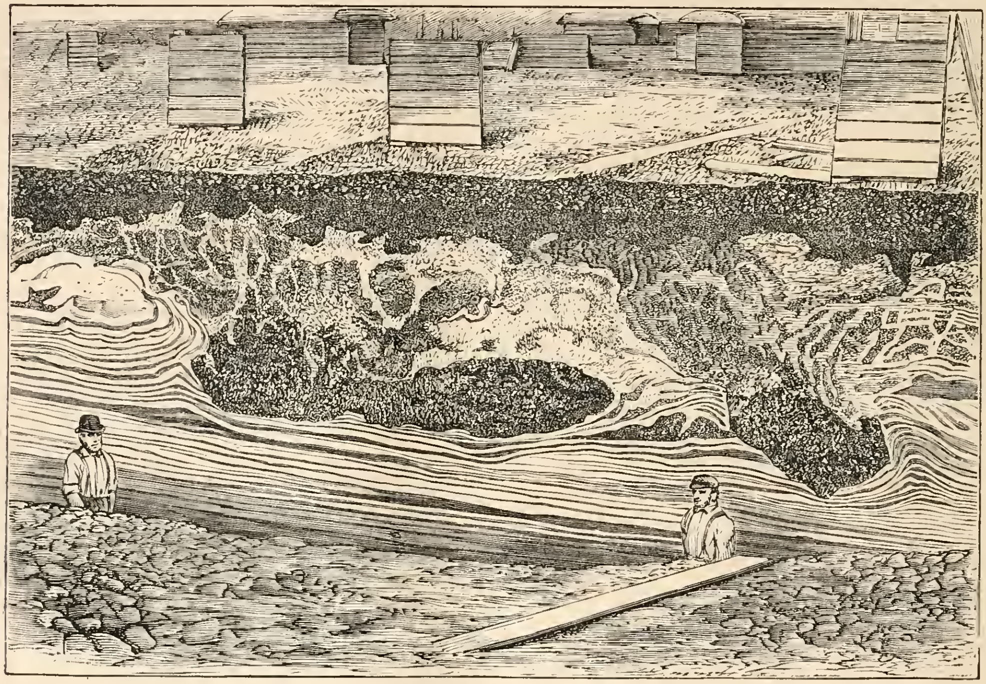

Fig. 106.—Section of Glaciated Clays and Gravel at Easthampstead, Berks, in Old Windsor Forest (March, 1891).

A little reflection will show that these marks of ancient glaciation, probably the work of pack-ice, as it was drifted and stranded by high winds on the margin of the old Thames Straits, may be taken as a

* See reference below to Mr. Shrubsole's paper.
† See "Journal of the Geol. Soc.," vol. xlvi., p. 561.

* A suggestion of Dr. J. W. Spencer, the State Geologist of Georgia, when on a visit to the author last year.

measure, until we obtain evidence of undoubted glacial action at higher altitudes, of the extent to which the higher and secondary valley-system of the Thames Basin proper had been carved out in preglacial times, the work done representing, in fact, in Berks and Surrey nearly 200 feet of vertical erosion, due to ordinary rain and river action. This will be better understood from the generalised section (Fig. 107). All this time the erosion of the minor upland valleys was encroaching upon the more ancient plateau-gravels, as well as cutting away the soft Bagshot strata, disinterring the flint pebbles of the Bagshot pebble-beds with the recession of their outcrop, and mingling these with the sub-angular flints during chronicle, and often enable us to detect the progress of physical changes. Thus it is not difficult to prove that the present aspect of the lower valley of the Thames is very different from what it must have been 1000 years ago. Instead of being confined within regular banks, the river must have spread its waters over a broad lagoon, which was dotted with marshy islands. This is indicated by the fact that the A.S. word *ea* or *ey* (an island) enters into the composition of the names of many places by the river-side, which are now joined to the mainland by rich pastures. Such are Bermonds*ey*, Putn*ey*, Batters*ea*,Herts*ey*, Mouls*ey*, Iffl*ey*, Osn*ey*, Whitn*ey*, and *Ea*ton or Eton. The Abbey Church of

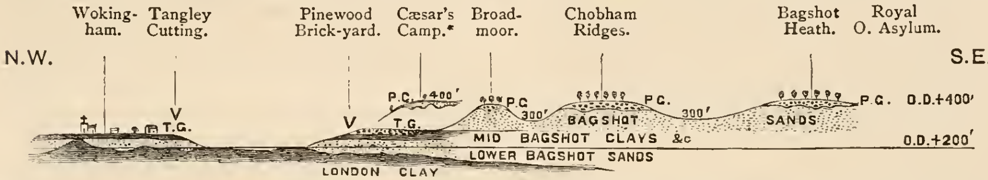

Fig. 107.—Relative Levels (O. L.) of the Plateau-gravels and the Glaciated Clays by Ninemile Ride, &c. P.G. plateau-gravels; T.G. terrace or secondary gravels; * 1 mile north-east of the line of section; V, glaciation strongly marked at these two places.

derived from the plateau-gravels themselves. Thus tier after tier of secondary or terrace-gravels has been formed, down to the present valley-floor, the same agencies having co-operated with those of glacial times, and continued their operations since the retreat of the ice. The lower (post-glacial) gravels of the modern valley contain, however, an admixture of Mercian pebbles with the wreckage of the more ancient plateau-gravels and the Eocene pebble-beds.

The recently published researches of Mr. Allen Brown, F.G.S.,* near Ealing, and of Mr. Shrubsole F.G.S.,† near Reading, were briefly discussed; and the special interest of the position of the human remains discovered by those two gentlemen was pointed out. The observations which they have published tell us (i) of the advent of man into the Thames Valley in company with the Mammoth, the Rhinoceros, and extinct species of *Bos*, *Equus*, and *Cervus*, closely upon the retreat of the ice; (ii) of the great antiquity of his appearance here, as indicated by the fact that the present Valley of the Thames has been deepened since that time to the extent of more than 100 feet at Reading, and to the extent of 50 feet at Ealing.

Even within the limits of the Historical Period important further changes can be traced in the Thames Valley, if we may trust the evidence furnished by those valuable linguistic "fossils" which occur in local names.

Dr. Isaac Taylor ("Words and Places," pp. 235, 236) writes:—"Local names form an en-

* "Journal Geol. Soc.," vol. xlii., pp. 192 *et seq.*
† *Ibid.* vol. xlvi., pp. 582 *et seq.*

Westminster was built for security on Thorn*ey* Island, and the eastern portion of the water in St. James's Park is a part of that arm of the Thames, which encircled the Sanctuary of the monks, and the palace of the A.S. kings. The name Chels*ea* (a contraction of *chesel-ea*) or *shingle-island* [tells that the place was encircled by the river]. The Isle of Thanet was as much an island as Shepp*ey* is at the present time."

[Erratum.—At the latest moment of printing the May number, a mistake occurred by which the woodcuts 84 and 85 were transposed. All our geological readers will have detected the error, and doubtless have already altered the Figs.]

SCIENCE-GOSSIP.

Dr. E. E. Klein, F.R.S. (Lecturer on physiology at St. Bartholomew's Hospital), on April 28, began a course of three lectures on Bacteria, their Nature and Functions (the Tyndall Lectures); and Mr. H. Graham Harris, M. Inst. C.E., on May 9, a course of three lectures on the Artificial Production of Cold.

A very able and suggestive paper by Mr. A. S. Seward appears in the last number of "The Naturalist," entitled "Fossil Climates."

In the last number of the "Geological Magazine," Mr. Smith Woodward describes a new species of Microsaurian from the Lancashire coal-measures under the name of *Hylonomus Wildi*.

MR. J. F. Jenner-Weir, the well known entomologist, has a capital paper in the last number of the "Entomologist," entitled "The significance of occasional and apparently unimportant markings in Lepidoptera." He thinks that some of them are vestiges of spots and other markings which were much more vivid in their ancestors, and therefore that such markings may contribute towards the phylogeny of genera.

WE call the attention of our readers to Professor Marshall's address delivered before the Birmingham Natural History and Microscopical Society on "Animal Pedigrees," which appears in the May number of the "Midland Naturalist."

AMONG the many valuable papers on natural history we get from the United States are the periodical issues of Dr. Riley's, "Insect Life," devoted to the economy and life-habits of insects, especially in their relations to Agriculture.

PARTS Twelve and Thirteen of Wallace's "British Cage-birds" (London : L. Upcott Gill) maintain the high artistic character of the preceding parts.

"THE CONCHOLOGIST" is the title of a new quarterly journal, price ninepence, devoted exclusively to conchology and molluscology. As our readers are aware, this subject has grown considerably beyond the bounds formerly assigned to it, and is now an important contributor to the facts of practical evolution. This new journal is edited by Mr. W. E. Collinge. The first number looks well and promises well.

THE Liverpool scientists are plucky people. They did not like their hightly readable and excellently edited "Research" being given up, so they have started another journal on pretty much the same lines, entitled "Discovery." It is published at threepence monthly. No. 5 is to hand, containing papers relating chiefly to economic science.

WE heartily comment, to all those whom it may concern, the last Report of the Manchester Museum (Owen College), issued by order of the Council.

A MOST useful and highly important pamphlet has been issued by the U.S. Department of Agriculture. "The Pediculi and Maleophaga affecting Man and the Lower Animals," by Professor H. Osborn. It is illustrated by forty-two of the parasites whose life-histories are described.

The Whit-week excursion of the members of the Geologists' Association this year was to the neighbourhood of Northampton, under the able leadership of Mr. Beeby Thompson, F.G.S., and Mr. W. D. Crick. Among the places visited were Wooton (Great Oolite, Inferior Oolite, and Upper Lias), Hopping Hill (basement-beds of Great Oolite limestone and Upper Estuarine beds), New Duston (Inferior Oolite), Kislingbury, Bugbrook (Middle Lias, &c.), Stowe-Nine-Churches (Great and Inferior Oolites), Heyford, Upton, Old Duston, Vigo, Shittlewell, Kingthorpe (Lower Estuarine sands and plant-bed) Pitsford, Spratten, Baughten, Moulten, &c.

MICROSCOPY.

A MICROSCOPICAL PUZZLE.—I was examining a glass slide under my microscope, containing some sections of the green berry of *Tamus communis*, which I preserved in 1889, by placing the specimens in gum-arabic between two glass slips. I now perceive many small ovoid transparent bodies, several were larger than the rest and could move slowly from place to place. What is the name and the cause of their appearance? Could they have come with gum-arabic? They do not seem to damage the specimen in the least, although they must certainly eat something. They are about one-sixth of an inch long when magnified forty diameters. This specimen is quite dry.—*Henry E. Griset.*

MOUNTING CORALLINES FOR THE MICROSCOPE.—In answer to this query in No. 316 of SCIENCE-GOSSIP. I beg to inform your correspondent and others interested in the study of fresh and salt-water Microfauna of a very reliable method of mounting Hydrozoa with all parts fully and naturally expanded. I have applied it particularly to Rotifers, Infusoria, and Hydræ, and can recommend it "where all other means have failed." It is best to place a few twigs of the fresh corallines containing living specimens into a very deep watchglass placed upon black paper, with very little of the water they have developed in. Allow all the animals to expand, and examine with a pocket-lens, if necessary, to ascertain when this has taken place. Then with a pipette add to the water in the watchglass a few drops of chloroform water. As soon as this is felt by the hydrozoa they draw in their tentacles, etc. However, if not too much of the anæsthetic has been given, and a little time allowed for it to evaporate, they will re-expand all their parts, at first only partly, but ultimately to their original extent. If rotifers are treated thus, the reviving of the individuals can be noticed by the drowsy motion of a few isolated cilia which begin their play again, at first very slowly, but gradually more and more vigorously. This stage is not the least interesting part of the experiment; it will enable the attentive observer to watch with greater ease every motion of the minute animals, take sketches of, and even photograph them. The treatment with chloroform water must necessarily be repeated by every one who makes the experiment for the first time, to let him know how often the hydrozoa will stand the effects of chloroform, and to give him for future experiments an approximate idea of the proper moment when the death-blow is to be given. The latter consists in pouring over the weakened, but still expanded animals, a hot or cold saturated solution of corrosive sublimate. To make its action still more effective it is advisable to withdraw beforehand as much of the water in the watchglass as possible, leaving just enough to keep the hydrozoa fully expanded. This method of fixing all sorts of small fish or saltwater inhabitants needs a little practice, but it teaches a great deal in an experimental way, and secures more truly satisfactory results than many of the other methods recommended, some of which I shall mention at some future time. After the material has been fixed by the described chloroform-sublimate method, it should be mounted in a cell (*not* a metal cell) with corrosive sublimate. Glycerine is not suitable at all, and balsam only if stains, such as Dr. Beale's carmine and iodine green (used successively to produce a double stain) have been used. For balsam-mounts the animals must be gradually dessicated in alcohol, placed or dropped with a pipette upon oil of cloves, (never use turpentine for such objects) and when they have completely sunk mount them in balsam. I shall not return to the study and cultivation of rotifers, hydrozoa, etc., as it would lead too far, and I shall refer to this subject at a future opportunity.—*C. O. Sonntag, Glasgow.*

New Slides.—Mr. Fred. Enock's slides are always welcome. They are not only well mounted, and the objects interesting, but they deal with some new phase of entomological discovery or research, so that both specialists and amateur naturalists can hardly do without them in their cabinets. The latest things Mr. Enock has sent out are connected with a subject to which he has devoted much special research—the natural history of insect-egg parasites. One preparation contains three eggs of *Psocus*, each containing a tiny parasitic fly (*Alaptus minimus*) ready to emerge. The parent parasite had laid the egg in each of the affected eggs, and the young larva had there found sufficient nutriment to allow its going through all its transformations there. Another preparation contains a specimen of *Alaptus minimus* which Mr. Enock bred from the egg. The exquisite beauty of these specimens must be seen to be appreciated. From Mr. E. Hinton we have also received two highly interesting and beautifully mounted marine objects for microscopical examination and study. One is a fine specimen of the sea-pen or "cock's comb" (*Pennatula phosphoreus*), with all the tentacles fully extended and surrounded and strengthened by bundles of acicular spiculæ. When seen on a dark ground this is a most exquisite specimen. Mr. Hinton's other preparation is a beautifully mounted palate of a South Australian mollusc (*Phasianella Australis*).

ZOOLOGY.

Notholca Acuminata.—On March 27th, I found a specimen of this rare Rotiferon in water taken from a clear ditch on Hayton Common, near Retford. The concave shape, as it turned on its side, was very marked. I was only able to find one specimen, although I took numerous dips. The only habitat given in Dr. Hudson's book is "Ornamental Waters near London."—*R. Clark.*

Solway Fishery.—Mr. J. J. Armistead in his circular (season 1890-91), mentions the following interesting "items":—"A black-headed gull (*Larus ridibundus*, settled on one of the ponds, when a large trout 'went for him,' probably taking him for a fly, and broke his leg. The bird was afterwards found dead." "The trout in the ponds have often been seen to rise at swallows as the birds skimmed over the surface, but the fish is a bad flying shot and has never been seen to hit one." "A large dog jumped into one of the ponds and had a hot time of it amongst the fish." Mr. Armistead has forwarded a consignment of ova to Natal, during the past season, which is reported as arriving there in splendid condition. He is now cultivating aquatic plants, shell-fish (mollusca), and crustaceans; especially fresh-water shrimp, for stocking fish-ponds." His circular says: "It is now a well-ascertained fact that the famous Gillaroo, and some other very fine breeds or varieties of trout, owe their reputation to the food on which they live; and that food has been ascertained to be shell-fish. I have met with instances in which trout supplied from this fishery have grown with great rapidity, and in three years, or less, have attained a weight of about four pounds, and these, on dissection, have been found to be gorged with shell-fish." I have myself taken trout of which the crop has been found to be full of the common black water snail, many of the shells being crushed into fragments; but I do not know if this crushing has been done with the mouth of the fish or after the arrival of the shells in the crop.—*Thos. Winder, A.M.I.C.E.*

A Partly Scalarid Specimen of Helix Aspersa from West Kent.—In a batch of shells sent to me for naming by Mr. J. R. Longhurst, from Dodington in Kent, I find an interesting Subscalariform monstrosity of *Helix aspersa.* The word subscalariform fully explains the character of the shell and any further description seems hardly necessary. Of course it is not so completely scalarid as the well-known specimen in the Natural-History Museum, but it is interesting as showing a "half-way house," between the contour of that shell and the contour of the type. The shell is bodily small; its height is 25 mill.; and its breadth 15 mill.—*J. W. Williams.*

Classificatory Position of the Mollusca.—In answer to Dr. P. Q. Kegan's query on p. 95, *ante*, as to why the Molluscan phylum is placed higher up on the zoological scale than that of the Annulosa, I think the chief reason is that of the nervous system, which shows greater concentration and, in the majority of the higher forms at least, is chiefly localised in the head as an œsophageal ring. In the lipocephala the head region has atrophied in adaptation to a "sessile inactive life" (Article "Mollusca" in Professor Lankester's "Zoological Articles," p. 102,) and taken all together, the Mollusca, in structure and embryological history, show a decided advance on the Arthropoda and Echinodermata, considering that the ancestor of both these three phyla is common to all, and to be sought in one of the simple worms. If Dr. Kegan will read the articles on the Annulosa and Mollusca in the last edition of the "Encyclopædia Britannica," I think he will very quickly come the conclusion that the present systematic position of the Mollusca is the only true one.—*J. W. Williams.*

Erratum.—In my note on "A new variety of *Helix Cantiana*" (p. 113 *ante*), about half a millimetre "should read" *above* half a millimetre.—*J. W. Williams.*

Mounting Shells.—I cannot "advise" Miss Priest on this subject, not knowing what other substances are used in mounting, but a very good material is formed by equal weights of gum arabic and gum tragacanth dissolved in water to the consistency of very thick paste. Hundreds of shells were mounted in this way in the British Museum. Shells even of considerable size can be easily set in any position in a bed of the gum. Dissolve the gum arabic in water, making it very thin. Pour this on the gum tragacanth, which swells considerably, and as it swells stir and add water, if necessary. Add a few drops of essential oil to prevent mould. The paste is most useful for general purposes. Caution is desirable in giving it away, every friend to whom I have ever given a pot has required that the supply should be kept up for the term of his natural life.—*G. T. Staveley.*

Local Conchological Society.—May I suggest to L.J.S. that it would add largely to the value of the work of his Conchological Society if a rule were made to preserve (if possible, mounted as microscopic objects) the tongues of all the mollusca whose shells are taken. The study of shells alone has now very much given place to that of the animals themselves with their shells, and the tongues are valuable in distinguishing genera. They will keep for years simply dried. Any members of the Society unable to mount them, might present them, with the shell laid out dry by its side, for the use of students of the mollusca.—*G. T. Staveley.*

BOTANY.

Notes on Vegetable Teratology.—Since much has been written of late concerning floral monstrosities, the following notes from my log-book on some which came under my notice a few years ago may be found interesting to such who have turned their attention to the science of teratology. In the summer of 1886 I found an isolated plant of *Campanula rotundifolia* growing in a shaded nook near Hampstead Heath, with a flower having the corolla divided into five distinct petaloid segments; the flower was found to be homogamous. The gamopetalous flowers of Campanula are decidely dichogamous, and further the vascular system of the corolla does not exhibit that of separate segments cohering by their respective edges, for the veins are found to ramify and anastomose all over the space between each contiguous dorsal rib in such a manner as to render any line of cohesion extinct. This dialysis must be regarded as retrogressive, a reversion to some primordial and less specialized condition, owing perhaps to the scarcity or entire absence of bees, correlated with the combined influences of temperature and the impoverished condition of the soil in which the plant grew. On November 7th, 1886, I saw a plant of *Angræcum sesquipedale* bearing two flowers with exceedingly large nectariferous spurs. The spurs of the flowers measured respectively 16 and 17¼ inches in length. The other parts of the flowers were found to be in a normal condition and of the usual size. The cause of the monstrous condition of these spurs was probably due to the unusually high temperature to which the plant had been subjected, and it is not an unfeasible presumption to suppose that as the nectariferous spurs are regarded as having originated through irritation set up by insect visitors, that an unusually high temperature would induce an additional flow of nutrition to those parts that are already hypertrophied through heredity. During the year of 1888 several teratological specimens came under my notice. I found two flowers of *Sempervivum arachnoideum* in which the margins of the anther cells bore from four to six ovuliferous processes. I also found three flowers of three different species of *Begonia* with stigmatiferous and ovuliferous stamens, and one flower in which the stigma was antheriferous. I also took note of several cases in which anthers occupied the place of the stigma. (1) A flower of *Campanula medium* in which four anthers occupied the position of the stigma. (2) A flower of *Galanthus nivalis* having two anthers in place of the stigma. (3) A terminal flower of *Digitalis purpurea* having six fertile stamens and no pistil; the two short stamens reaching maturity first, the two intermediate following, and finally the two largest. I saw on a plant of *Aquilegia* (var. ?) growing in my garden a flower with two spurs bearing rudimentary ovules, and three of the stamens were stigmatiferous and ovuliferous. The probable cause of the above-mentioned abnormalities I believe to have been largely due to environments, and the following notes on *Fritillaria meleagris* and a variety of *Mimulus* tend somewhat to support this conclusion. In April of the same year I obtained a bulb of fritillaria from its native haunt, the bulb was replanted and rested, and it bloomed again in the following year at the end of March. The perianth of the flower was campanulated, but considerably smaller than that of the previous year, the stamens were metamorphosed into petals, and one crumpled petal very broad at the base occupied the position of the pistil. The plant before flowering had been kept in a dry atmosphere, and a somewhat dry and poor soil. I purchased last year a pot of *Mimulus* (var.?) from a street stall, and on bringing it home it was allowed to remain in the dry warm atmosphere of a room; when the new flowers opened they were found to be much smaller, and had lost the delicate salmon tint for which I had been induced to purchase it. A few days after the plant was removed to the greenhouse, and after a lapse of five weeks new flowers developed and were characterized by the colour, size and shape of those expanded when I purchased the plant.—*J. H. A. Hicks, F.R.H.S.*

HUTCHINSIA PETRÆA. Hooker (3rd. Ed. 1884) states that this pretty little Cruciferous plant is to be found in Eltham Churchyard, where it has been naturalised, having been planted, it is supposed, by Dillenius. Has any reader of SCIENCE-GOSSIP found it there within recent years? I have made a careful search for it this spring but have failed to find it, and therefore imagine it to be extinct.—*W. B., Plumstead.*

VARIATION OF COLOUR IN PLANTS.—Having read Mr. Jones' interesting notes on the "Variation of Colours in Plants," I think the following observations made last autumn when staying at Carr Bridge, Inverness-shire, may perhaps be of some interest. The season was an extraordinarily good one from a Botanical point of view, the heather far above the average, every tree and shrub being covered with blossom or fruit, the currant and gooseberry trees had their lower branches dragged down to the ground by the unusual weight of fruit, and the raspberries lasted from about the 15th of August to the same date in September. Wild flowers too, were very fine and numerous, especially "the blue bells of Scotland" (*Campanula rotundiflora*) occurring for the most part on grassy slopes and the outskirts of corn-fields, where they exhibited great variety both in size and colouring, varying from a deep purple to a very pale blue; the contrast, however, was greatest in size, some plants preferring quality to quantity, bearing three or four bells per stalk nearly an inch in depth, while others bore double the number but only a quarter of the size. With regard to the white variety I found but two examples, one on the edge of an oat-field, the other at a burn side. Both were fine plants, bearing eight and five bells respectively of a beautiful creamy-white colour. I have met with this variety in several counties, and though of rare occurrence it appears to be generally distributed over Scotland. The common scabious (*Knautia arvensis*) was very plentiful and of every shade between purple and snow white, the same plants frequently bearing flowers of different tints, one specimen had two flowers on the same stalk, one normal, the other dwarf and about three quarters of the way up the main stem, to which it was attached at right angles by a small pedicle. This species rarely occurs above an altitude of 1,000 feet, thriving best in moist grassy situations. The most abundant plant and the most striking in its colour effects was the common heather or ling (*Erica vulgaris*), which, clothing as it does, miles of hill-side and moorland with its lovely purple bloom, constitutes one of the greatest charms of Highland scenery. This species is by no means constant in its colouring, there being at least three distinct varieties: (1) purple inclined to mauve; (2) purple inclined to carmine; (3) pure white, which last is very rare and when young hard to distinguish from variety (1), the buds of the latter being almost colourless, save a faint pinkish tinge at their base. I have found it on every moor visited, only, however, in small sprigs amongst miles of the ordinary type. After flowering, the heather still serves a number of purposes, being used for brooms, thatching, making beds for the poor, and heating ovens. It is considered lucky to find the white variety. The cross-leaved heath (*E. tetralix*) is, I think, the prettier flower of the two, though its beauties are not so obvious until we raise its modestly hanging head, which at once reveals the wealth of colour displayed in the shading of its delicate bells. These being carmine-coloured at the base, make the flower apparently darker than it is, the bells being in reality quite white at their mouths and increasing in colour towards the base. This species grows plentifully in peat-bogs and other moist situations on the moors, being generally found in clumps, getting rather straggling above an altitude of 3,000 feet. It is not apparently subject to much variation, though last August I had the good fortune to light on a clump, bearing white flowers; not a pale transparent, but an opaque creamy-white; there were over thirty blooms, the roots soaking in water. Never having heard of this variety before, I should very much like to know whether any reader of "SCIENCE GOSSIP" has met with it? The common purple heath (*E. cinerea*) is the least abundant of the three mentioned, being only found on bare rocky ground and the faces of cliffs, where comparatively little moisture accumulates, and is not subject to variation in colour. It occurs at an altitude of 4,000 feet very stunted, about 2,500 suits it best, where I have taken specimens nearly a foot long, having at least six inches surrounded with bloom. I have not heard of a white variety. The mosses were well represented; on the moors, by the common club moss (*Lycopodium clavatum*), called there, "stag's horn moss," and the Alpine club moss (*L. alpinum*); and on rocks, boulders, &c. by *Dicranum scoparium* and *D. Bonjeanni*. The peat-bogs and water-holes were full of innumerable water-plants and mosses, most of them unknown to me, forming a carpet of wonderful beauty in pattern and colouring, such a one as only Nature's pencil could design or her brush enliven with its lovely shades of yellow, green, pink, and purple; truly an enticing seat, but to say the least of it, "just a wee saft." I recognised here the following species of Sphagnum, *S. cymbifolium*, *S. rigidum*, *S. Austini*, and several other specimens I was unable to identify. Parnassus grass (*Parnassia palustris*), the two cotton grasses (*Eriophorum vaginatum* and *E. polystachum*) and the fragrant sweet gale (*Myrica gale*) were abundant, greatly adding to the beauty and attractiveness of the spot. In dryer situations, cranberries (*Oxycoccus palustris*) and crowberries or crakeberries (*Empetrum nigrum*) grew abundantly amidst the heather, the latter in black shining clusters of five or six, or singly along the small-leaved stems, and were quite as conspicuous as their larger-leaved neighbours, indeed, growing as most of these do right down under the leaves, it is no wonder they so rarely ripen, the average colour being scarlet above and white below, even when ripe they are dry and tasteless, a contrast to the very juicy and not unpleasantly flavoured crowberries; both, however, are very inferior to the purple bilberry or blayberry (*Vaccinium myrtillus*) also called blowberry, so plentiful in woods. From a distance perhaps, a Scotch moor does not appear a very promising field for the botanist, but on coming to close quarters, the great wealth and variety of vegetable life is truly astonishing, and I feel sure anyone spending even a few hours in studying these moorland wonders, will be amply repaid for so doing.—*D. H. S. Stewart.*

GEOLOGY, &c.

THE NORTH-WEST OF ENGLAND BOULDER COMMITTEE.—A society under this title has been formed for the study of the glacial phenomena of the North-West of England, North Wales, and the Isle of Man. It has been in existence only two months, but already numbers fifty-two members, amongst whom may be reckoned some of the best-known glacial geologists of the North of England. The society is about to publish shortly a handbook for the guidance of its members in the methods of observing glacial phenomena. Meetings are held once a month, and the society is peripatetic, like the British Association.

NOTES AND QUERIES.

A WHITE TOAD.—We are accustomed to keep one or two toads in the greenhouse, for the purpose of keeping off injurious insects. One of these animals was put in about four months ago, and has turned a light yellowish white. The temperature of the house ranges from about 50° to 70° Fahr. Is it the heat that has brought about this curious change?—*W. H. Seyfang.*

BATS FLYING IN SUNLIGHT.—On April 15th, 1891, I was very much surprised to see a small bat flying about in full daylight. I watched it for some time, and on April 18th I and a friend of mine went to the same field and saw two bats. The sun was shining brightly on both mornings, and both times it was after 11 A.M. The two were busy when we left, at nearly 1 P.M.—*D. M. Higgins*, 93 *Wellington Street, Luton.*

BATS IN DAYLIGHT.—In answer to Mr. J. E. Taylor's note about bats flying in broad daylight, I find the following note in my journal. "I witnessed a curious sight on Sunday, February 15th (1891), the day being bright but cold, on coming out of church just before one, a pair of bats (? species) flying about as if it had been twilight, although as a matter of fact the sun was shining brightly." This was at Harlington, Middlesex.—*H. J. Torpey.*

SOCIETY FOR THE S.E. DISTRICT.—Would any gentlemen residing in the S.E. district, who are willing to join a small society for mutual and practical study, and field-work send their names and addresses to Mr. L. O. Grocock, 13 Lower Maryon Road, Charlton, S.E. The subscription would be small, and workers in all branches of Natural History would be welcomed.

VARIATIONS OF COLOUR IN PLANTS.—Among the plants liable to variations of colour I have seen no mention of *Bartzia odontites*, white specimens of which are frequent by the roadside at South Weald and Navestock in Essex. The soil is a stiff clay.—*Norris F. Davey, Abergavenny.*

SWALLOWS DESTROYING THEIR YOUNG.—The philosopher Kant one day was passing a certain building in his daily walk, and on looking up, he discovered as he fancied that the old birds were actually throwing their young ones out of the nests. It was a season remarkable for the scarcity of insects, and the birds were apparently sacrificing some of their progeny to save the rest.—*M. A.*

BATS IN DAYLIGHT.—On the 27th April I saw a large bat flying over the river Medway between 12 o'clock and 1 P.M., a warm, but not very bright day. A few days before a little bat was seen by several people flying near the edge of a wood down in the Weald, at midday. Can it be scarcity of insects that brings the bats out at unusual hours?—*M. E. Pope.*

EARLY APPEARANCE OF THE CUCKOO.—The cuckoo was heard on the Barmouth Hills on the 28th of March. Some people say they heard him in the same direction a week before that date.—*M. E. T., Barmouth, N. Wales.*

THE TWO SIDES OF THE MEDAL.—It seems to me that a great deal of what Mrs. Bodington remarked on this subject is difficult to controvert. Everybody knows that certain diseases acquired during the lifetime of the parent are hereditary in the offspring, and hence the jealous care exercised by families and the state to prevent the diseases in question, being communicated to the healthy. J. W. Baylis, says the whole question hinges on whether these diseases be acquired or congenital. There are many diseases peculiar to man that must, at all events, have been acquired during the lifetime of the race. Not to talk of diseases the result of immorality, there must have been a time when neither drunkenness nor suicide were manifest. I believe the earlist tendency to a hereditary love of alcoholic spirits arose from our first ancestors who began to indulge too freely, and not from the temperate and moderate. In saying this I know the avidity with which savages take to our intoxicants. Most of these savages have, however, some stimulant or narcotic of their own, less potent than ours, which is therefore preferred. Indeed the building up of that degree of temperance and wisdom, with regard to the use of stimulants, must have been a process that has risen since distillation and fermentation were invented. No doubt it would be acquired somewhat in the lifetime of a parent, and heredity would strengthen it. There are families whose genealogies show us a procession of sober individuals, just as there are others who present us with a long succession of topers. In the same way we might ask concerning every contagious or infectious disease peculiar to man, or to circumstances interwoven with civilisation, Who took it first? Was it not acquired first of all in the lifetime of some individual? If so, then, being hereditary, it seems a fair case for those who believe in use-inheritance.—*J. Shaw*, *Tynron*, *Dumfriesshire*.

Trout.—The following extract is from this season's price list of the Howietoun Fishery, Sterling :—"The Rainbow trout in the second generation, have proved much more satisfactory than was anticipated (from noting the imported ova). Where a depth of water of eight feet or over can be obtained, and where the fish can be confined, we now recommend them as the quickest growers and the most beautiful salmonoid we have yet met with. But they must have deep water." I recently had the pleasure of turning about 2200 Loch Leven (*S. Levenensis*) yearling trout into reservoirs near here, which had been hatched and reared by the managers of this fishery: and I noted that although some of them were in unchanged water for over seventeen hours, there were only two dead fish in the tanks; the rest were so strong that they "cut to cover," almost before we could get a sight of them in their new abode.—*Thos. Winder*, *A.M.I.C.E.*, *Sheffield*.

Cure for Bite of Mad Dog.—In searching a number of ancient documents, I recently found the following curious receipt, which may perhaps be of sufficient interest to deserve a place in the pages of Science-Gossip. I preserve the original spelling and punctuation. "An infalliable cure for the Bite of a mad dog brought from Tonquin by Sir George Cobb Bart. Take 24 grains of native Cinnabor 24 grains of factitious Cinnabor and 16 grains of Musk; grind all these together into an exceeding fine powder; and put into a small tea-cup of Arrack rum or brandy; let it be well mixed and give it y^e^ person as soon as possible after y^e^ bite; a second dose of y^e^ same must be repeated thirty days after; and a third may be taken in thirty days more, but if the symptoms of madness appear on y^e^ persons they must take one of y^e^ above doses immediately and a second in an hour after, and if wanted a third must be given a few hours afterwards. The above receipt is calculated for a full grown person, but must be given to children in smaller quantities in proportion to their ages. This medicine has been given to hundreds with success and Sir George Cobb himself has cured two persons who had y^e^ symptoms of madness upon them. If in the madness they cannot take in liquid, make it up into a bolus with honey: after the two first doses, let it be repeated every three or four hours till y^e^ patient be recovered. This repetition to be omitted unless necessary. Take all imaginary care that the musk be genuine." This mem. bears date 1760.—*Thos. Winder*, *A.M.I.C.E.*, *Sheffield*.

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

W. M. Osmond.—The micro-photo of the articular process found on the body of an Indian caterpillar is very remarkable. We should advise you to send a photo to Mr. Beddard, Prosector, Zoological Society.

Miss R.—You will find a good description of how to bleach and prepare skeleton leaves, seed-vessels, &c., in the volume of Science-Gossip for 1872.

C. S.—Get "Notes on Collecting and Preparing Natural History Objects," edited by J. E. Taylor, published by W. H. Allen & Co., 3*s.* 6*d.* Also all the vols. (2*s.* 6*d.* each, 8 in number) of "The Fauna and Flora of the British Islands," published by the S.P.C.K., except those you name. "The Playtime Naturalist" (London: Chatto, 5*s.*) will help you considerably. "Elementary Microscopic Manipulation," by T. C. White.—"Half-hours with the Microscope," by Dr. Lankester (W. H. Allen, 2*s.* 6*d.*).

S. A. Chambers.—The specimen you sent us was a somewhat dwarfed var. of the purple dead nettle (*Lamium purpureum*).

P. T.—Apply to Messrs. W. Wesley & Son, Essex Street, Strand, who keep all sorts of secondhand scientific books on all sorts of subjects.

R. W.—Get Mr. F. Enock's list of entomological preparations, with the descriptions accompanying them, published two or three years ago by him.

We are informed that a Rambler's Field Club for the South-west of London is now in course of formation. Apply for information to Mr. W. Andrews, Landseer Street, Battersea, S.W.

R. M. S.—The "Diatomiste" may be obtained of J. Tempère, 168 Rue St. Antoine, Paris; price of each number, 4*s.*

T. Brown (Bolton).—The matrix of the fragment of millstone grit is chiefly a partly decomposed felspar. There is also a secondary deposit of silica.

EXCHANGES.

Wanted, living British spiders. Micro preparations given in exchange.—John Rhodes, Blackburn Road, Accrington.

Wanted, to exchange foreign postage stamps with moderate collectors of from 1000 to 2000. Also, what offers in stamps for collection of British butterflies and moths, about 650 specimens, in good condition?—Stanley Morris, School Hill, Lewes, Sussex.

Wanted, foreign shells and unmounted diatoms, polycistines, forams, &c., in exchange for choice micro-slides of every description, and British marine shells. Foreign correspondence solicited.—R. Suter, 5 Highweek Road, Tottenham, London.

OFFERED, books. "Elementary Chemistry," "Elementary Physics," "Practical Chemistry," "Inorganic Chemistry," "Elements of Acoustics," "Our World, its Rocks and Fossils," "Livre des Versions," "German Grammar," "School Hist. of England," and a number of similar books of instruction. Offers wanted in other books, shells, stamps, or garden requisites.—Mrs. Heitland, The Priory, Shrewsbury.

"GARDENING Illustrated," in seven volumes, 1884–90, unbound. What offers in scientific or other books?—A. B., Advertiser Office, Chepstow, Mon.

TRINIDAD lepidoptera offered for a good classified list of lepidoptera — Kirby preferred. — W. E. Broadway, Royal Botanic Gardens, Trinidad, B.W.I.

OFFERED, good botanical microscopic slides, for books on botany or microscopy.—J. Collins, 147 Muntz Street, Birmingham.

EGGS of British ducks and other birds, wanted in exchange for nests and eggs.—W. Gyngell, 28 Westborough, Scarborough.

WANTED, cleaned diatoms, foraminifera and polycistina, volvox and other freshwater algæ in vials, insects' eggs, podura, lepisma, fleas, sawflies, cockchafers, large water-beetles, and other insects. State requirements in exchange. — Henry Ebbage, Framlingham, Suffolk.

DUPLICATES.—*Trochus striatus*, *Pupa ringens*, *Melania sp.*, *Murex aciculatus*, *Purpura hæmastoma*, *Helicina beryllina* (?), *Littorina scutulata*, *Acmæa spectrum*, and others. Desiderata, exotic mollusca, especially land shells.—Brockton Tomlin, The Green, Llandaff.

Clausilia Rolphii (verified by Mr. Th. Cockerell) from a new Kentish locality, in exchange for other not common British land and freshwater shells.—Rev. J. W. Horsley, Woolwich.

SCIENCE-GOSSIP, numbers 157 to 205, unbound. Exchange for geological lantern-slides, or offers.—J. T. Cook, Edina, Stoneygate, Leicester.

Helix effulgens, *H. calcadensis*, *H. tapeina*, *H. achatina*, *H. plectostoma*, *H. attaranensis*, *H. textrina*, *H. scalpturita*, *Bulimus domina*, *B. Nevilliana*, *B. Beddomiana*, offered in exchange for other land or for marine shells. *Pecten bifrons*, *P. plica*, *P. lemniscatus*, in exchange for other species of pecten.—Miss Luter, Arragon Close, Twickenham.

OFFERED, eggs of lapwing, moorhen, razorbill, curlew, missel-thrush, ring dove, rook, black-headed and lesser black-backed gull, coot, sedge warbler, lesser redpoll, &c., also SCIENCE-GOSSIP, unbound, for 1890. Wanted, eggs of raven, swift, ruff, nightjar, hawfinch, kite, goshawk, &c.—G. Nicholson, 3 Crown Street, Newcastle-on-Tyne.

OFFERED, Beale's "Micro. in Medicine;" Berkeley's "Introd. to Cryptogamic Botany," in first-class binding; Baker's "Employment for the Microscope," with all the original plates; "Alternation of Generations" (Stenstrup), Ray Soc.; pure gathering of batrachiosperma for mounting. Wanted, "Journal of Microscopy and Nat. Science" for last three years (vols. 6, 7, and 8), bound, works on freshwater algæ, rhizopods, &c.—J. E. Lord, Rawtenstall.

LANTERN slides (photos, statuary, &c.), wanted in exchange for first-class micro objects.—F. E. Hillman, 1 Harcourt Road, Wallington, Surrey.

WANTED, British land or freshwater shells, or any books relating to same. Will give micro material or slides, or foreign stamps in exchange.—A. Alletsee, 1 South Villas, Kensington Road, Redland, Bristol.

FINELY preserved sea-urchins (*E. sphæra*) with spines—*M. incurva*, *pellucida*, *T. fabula*, *M. subtruncata*, *S. ensis*, *T. papyracea*, *H. pellucidum*, *T. testudinalis*, *H. ulvæ*, *A. cygnea* (Scotch), *S. corneum*, var. *pisidiodes*, *P. fontinale*, *P. pusillum*, *S. elegans*, *H. nemoralis*, var. *rubella*, &c., offered for British or foreign shells, or lepidoptera.—T. Paterson, 59 Hazelbank Terrace, Edinburgh.

WANTED, *Leda caudata*, *Natica helicoides*, *Pleurotoma striolata*, *Vertigo moulinsiana*, var. *pusilla*. Will anyone oblige me with any in return for any of the following rare shells: *Cyclostrema serpuloides*, *Scalaria clathratula*, *Eulima bilineata*, *Odostomia nivosa*, and others.—T. E. Sclater, Bank Street, Teignmouth.

WANTED, land and freshwater shells of fossils from any formation not in collection, in exchange for *Ancylus lacustris*, *Planorbis vortex*, *P. carinatus*, *Limnæa glaber*, *L. stagnalis*, *L. peregra*, *Sphærum corneum*, *Physa fontinalis*, *Helix hortensis*, *H. pomatia*, *H. hispida*, *Clausilia rugosa*, *Pholas candida*, and others.—R. D. Laurie, 19 Willow Bank Road, Birkenhead.

OFFERED, Phillips' "Metallurgy," Phillips' "Geology," Catlow's "Conchology," Lardner's "Natural Philosophy," &c. (list sent), in exchange for secondary fossils. Address—M., 56 Clarendon Villas, Brighton.

WANTED, foreign shells not in collection, more especially helices and bulimi. Offered, other shells. Foreign correspondence invited.—G. R. Sykes, 13 Doughty Street, London, W.C.

HAIRS and spines of sea-mouse, in exchange for micro-fungi, unmounted material.—A. Montague, Penton, Crediton.

Marginella glabella (from Mazagan), *Haliotis tuberculata* (Mazagan), *Helix pomatia* (Switzerland). Exchange foreign shells not in collection.—L. Montague, Penton, Crediton.

PROCTOR'S "Star Atlas," and "Half-Hours with the Stars," offered in exchange for books on microscopy. Also *Hydra vulgaris* and *Melicerta ringens* for *Hydra viridis*.—W. F. Kelsey, Maldon.

DREDGINGS and good drift wanted, containing shells, &c., from the following places: coast of Scilly, Guernsey, Scotch Isles, North Sea, Irish coast, near Cork, and from the entrance to the Bristol Channel. Good exchange given.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

OFFERED, SCIENCE-GOSSIP, unbound, clean, complete, 14 vols., 1876 to 1889. Wanted, algological or botanical books, or other exchange.—T. H. Buffham, A.L.S., Comely Bank Road, Walthamstow.

SEVERAL hundred British lepidoptera, in exchange for outdoor plants, roses, and ferns.—W. H. T., 111 Queen's Road, Portsmouth.

HUXLEY'S "Physiography," Nos. 245 to 291 of SCIENCE-GOSSIP, and entomological collecting and preserving apparatus, in exchange for science books or micro-slides.—W. E. Watkins, 30 Dalmeny Road, Tufnell Park, London, N.

OFFERED, Cassell's "Natural History," Parts 1 to 8, new edition now appearing.—Chas. Leigh, 47 Sydney Street, London, S.W.

WANTED, nests of goldfinch, long-tailed tit, golden-crested wren, and redpole, during the season. Eggs, shells, or lepidoptera offered in exchange.—William Hewen, 12 Howard Street, Fulford Road, York.

"NATURE," in weekly numbers, unbound, for the year 1882, three numbers missing; 1883, five numbers missing; 1884, complete, in exchange for British land and freshwater shells.—T. Place, 50 Townend Street, York.

SCIENCE-GOSSIP, in parts, from January, 1887, to December, 1890. Offers requested in foraminiferous material, papers on the foraminifera, or good micro-slides.—A. Earland, 3 Eton Grove, Dacre Park, Lee, S.E.

WANTED, British land and freshwater shells. Can offer in exchange *Pupa secale*, *Carychium minimum*, &c. Address—H. T. Smith, 11 Oakfield Place, Clifton, Bristol.

WANTED, a few British mosses; will give slides, &c., in exchange. Address—T. B., Conservative Club, Hinckley.

WANTED, a good 1½-inch objective, or a section cutter, in exchange for bound vols. of "Journal of Royal Microscopical Society," for 1887 and 1888.—F. Coles, 53 Brook's Road, Stoke Newington, London.

OFFERED, *Xylophaga dorsalis*, *Pholas crispata*, and *Mya arenaria*, last two with siphons extended. Wanted, shells not in collection.—J. Smith, Monkredding, Kilwinning.

WANTED, Bowman's "Cotton Fibre" and Porter's "Treatise on Silk." State desiderata to R. S. Dawson, Belmont, Shipley.

SCIENCE-GOSSIP, from commencement to present date of issue, what offers?—Linder, New Brompton, Kent.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Coal, and What we Get from It," by R. Meldola (London: S.P.C.K.).—"The Missouri Botanic Garden."—Fifth Report U.S. Entomological Commission—Forest Insects," by A. S. Packard (Washington). — "Annual Report Fruit-Grower's Association of Ontario, 1890."—"Colour Measurement and Mixture," by Capt. Abney (London: S.P.C.K.).—"Telescopic Work for Starlight Evenings," by W. F. Denning (London: Taylor and Francis).—"Zoological Articles," by Prof. Lankester and Others (Edinburgh: A. and C. Black).—"Geologists' Association—A Record of Excursions made between 1860 and 1890," edited by T. V. Holmes and C. D. Sherborn (London: Edward Stanford).—"Discovery," No. 5.—"The Conchologist," No. 1.—"The Pedicula and Mallophaga," by Prof. H. Osborn (Washington: Govt. Office).—"Bulletin of Microscopical Society of Calcutta."—"Nature Notes."—"American Microscopical Journal."—"The Microscope."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Garner."—"Feuille des Jeunes Naturalistes," &c., &c.

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

GUMS, RESINS, AND BALSAMS.

By H. DURRANT.

IN the following few notes on several of the better-known gums and resins, I have adopted no systematic arrangement. Neither have I said all I should have liked to have said concerning them. But as it was not consistent with the room at my disposal to mention all their various uses, I have suppressed the minor properties and given in as few words as possible the more interesting features.

I have endeavoured to give the name of the plant producing each variety, together with its uses, native country and other interesting items.

The distinctions between gums, resins and balsams may be briefly tabulated as follows :

Resins are the inspissated or thickened juices of plants. They are generally mixed with an essential oil, are insoluble in water, but are soluble enough in either alcohol or the essential oils. Their general characters are inflammability and fusibility. Their ultimate components are carbon, oxygen, and hydrogen.

Gums are soluble in water, but are insoluble in alcohol.

Balsams or Gum resins contain a quantity of gum, are partly soluble in water, partly so in alcohol, or in other words, they take both alcohol and water to perfectly dissolve them.

Gum arabic is produced by several species of acacia. It is quite soluble in water, but in alcohol, ether and oils it is insoluble. It forms an acid solution, as permalate of lime is present. Several of the metallic oxides combine with it. It is very nutritious, so much so that the Arabs who gather it nearly live upon it during harvest-time. We import it from the Levant, Barbary, Senegal, Cape of Good Hope, India, Cairo, &c.

Gum senegal the product of *Acacia senegal.* This is the best kind of Arabian gum. It is much more clear than gum arabic, sometimes entirely white, in drops as large as a pigeon's egg. Its principal use is in the manufacture of silks, muslins, crapes, &c., to give them the requisite amount of stiffness and glaze. It is also mixed with the colours in calico printing to give them solidity.

Gum tragacanth or gum dragon. This is obtained from *Astralagus tragacantha.* In appearance it resembles twisted ribbons, of a brownish white colour, opaque and rather ductile. When pulverized in a mortar it is of a white colour. The operation of pulverizing is a difficult one, and should be performed in a hot mortar, the gum having been previously heated to 212° Fahr. This gum has a remarkable power of consistence, a small piece swelling up to many times its own size. It has not, however, such a strong power of adhesiveness as gum arabic, but if equal parts of the two be mixed together it forms a nice white gum, very suitable for fastening plants to paper, and other natural history work. The tree is itself a native of Crete.

Gum sandarach. The product of *Callitris quadrivalvis* is a native of Barbary. This gum is chiefly used in the manufacture of varnishes, for which it is peculiarly adapted. The Turks employ the wood in the construction of their mosques, it being very tough and possessing great lasting qualities. Importation about fifteen tons per annum.

Barbary gum, a very dark-looking kind produced by the *Acacia gummifera.* In the manufacture of lozenges and confectionery it has valuable qualities.

It calls for no special comment. We import it from the Morocco coast.

Gum gedda, an inferior quality of the foregoing. Reddish colour.

Canada balsam. This is supplied by the *Abies balsamifera*. It is contained in blisters in the bark. The blisters are punctured, and the balsam is collected as it exudes. This is a most useful substance, being in great demand in a number of manufactures, &c. It is used in cementing lenses together. In microscopy comment is needless, but besides being an excellent preservative, it gives great transparency to the object. We import nearly all of it from America.

Guaiacum. This resin exudes from the *Guaiacum officinale*, a native of Jamaica and the surrounding islands. A piece of paper treated with tincture of guaiacum takes on a green tint under the violet rays, when exposed to the prismatic spectrum, through oxidization. Red rays destroy the colour. Solubility, 90 per cent. in absolute alcohol. Lignum vitæ, the hardest and heaviest wood known, and which sinks on being placed in water, is the timber of this tree.

Copal. This is the product of several leguminous plants in Africa, East Indies, South America, and Australia. It is generally seen in large angular lumps, often as large as a hen's egg, of a bright yellow colour, and very transparent. The African variety is of a darker colour, and not so transparent; its surface appears dusty. The Australian is the largest. That from the East Indies is the product of *Hymenæa courbaril*. In lumps sometimes nearly square and generally covered all over with slight indentations. It is known as gum anime. Chiefly used for fine varnishes.

Gum mastic, the product of *Pistacia lentiscus*. In small ovoid and round tears about the size of a pea and rather flattened. The tree is a native of Chio and Northern Africa. To obtain the resin the bark is cut transversely, after which the mastic exudes in small drops and either hardens on the bark or falls to the ground. That which falls to the ground is the inferior quality. It has a fragrant smell, and is much used by the Turkish ladies in their toilet. A fine varnish is made from it. Dentists also use it for stopping hollow teeth. About ten or twelve tons are imported annually, mostly from the Levant.

Gum dammar: this is a light-coloured substance which is obtained from the *Pinus dammara*, native in India, from whence it is exported. It is very useful in making varnishes, especially photographic. It is soluble in benzole, only partly so in alcohol, and is used sometimes as a substitute for Canada balsam.

Gum gamboge: a product of *Hedradendron gambogioides*, native on the Malabar coast and in Ceylon. It is a gum resin, and is obtained by puncturing the bark of the tree when the flowers begin to appear. We know it best by its appearance in amorphous masses, but it also takes the form of hollow rolls and solid cylinders. The best hollow rolls come from Siam. From this gum the beautiful yellow colour of gamboge is manufactured.

Gutta-percha: the inspissated juice of *Isonandra gutta*. When freshly gathered it is rough, dry, slightly soluble and very inflammable. To render it fit for use it is immersed in boiling water; this softens it and makes it capable of being moulded into any shape, which it retains when cold.

The juice is found between the bark and the wood. Its uses are too numerous to specify, many being too well known.

Caoutchouc, india-rubber, is the product of many euphorbiaceous plants. We get most of it from the Brazils and Central America. In Brazil it is obtained from the *Siphonia elastica*, which grows to a height of between fifty to sixty feet; and in Central America it is obtained from *Castilloa elastica*. Most of that we now use comes from Central America, where the juice is simply collected into cups, from incisions made in the bark. To coagulate the milky juice and convert it into rubber fit for exportation, the juice of a vine called "achuca" is mixed with it and so powerful is its action that five or six minutes is sufficient to produce coagulation. The Brazilian method slightly differs. The juice is first collected in clay bowls, it is then smeared over various shaped moulds, made also in clay and taking the form of bottles, balls, spindles, &c. Successive coats are laid on, each one having previously been allowed to thoroughly dry; either in the sun or in the smoke of a fire, which blackens it. When a sufficient thickness is obtained, the clay is washed out leaving the india-rubber ready for exportation. The trees yield twenty or thirty gallons of juice, and when we consider that each gallon will produce two pounds of market india-rubber, the harvest is not so bad. Other trees producing caoutchouc are *Siphonia brasiliensis*, *S. lutea*, and *S. brevifolia*.

Dextrine, British gum, torrified starch. To produce this gum, starch is heated until vapour rises; by this procedure the starch becomes soluble both in cold and hot water, and all its gelatinous character disappears. It can also be made by moistening 1000 parts of dry starch with very dilute nitric acid. It is formed in small blocks and dried in the open air, afterwards being placed in an oven heated to 152°. After this they are pulverized and again dried by heat. In colour dextrine is pale yellow; insoluble in alcohol, more flexible and not so brittle when dry as gum. Dextrine and starch have the same chemical composition $C_6H_{10}O_5$. The gum on the back of postage stamps is dextrine.

Turpentine. This valuable fluid is the product of several trees, principally *Pinus palustris* and *P. tæda*. Most of it comes from the United States, generally in large barrels, of the consistence of treacle or honey. The oil is obtained by distillation and the remainder is the common resin sometimes called rosin, which is applied to a variety of uses. There are several kinds of turpentine, viz., Venice turpentine, procured from the *Abies larix;* Strasburg, from *Abies pectinata;* Bordeaux turpentine, from the *Pinus pinaster;* and Chio turps, from the *Pistacia terebinthis.*

Gum thus or frankincense, an odoriferous product of the *Boswellia serrata.* It is of slight use except for its odour, which the Roman Catholics turn to account in their churches. Employed also by the ancient priests of Egypt, its odour destroying the foul emanations from the sacrificcs. It is imported from India and sometimes the Levant.

Asafœtida (*Narthex asafœtida*). This flows from incisions made in the root of the tree. In colour it is milky white, but after it has been dried it takes on a pinkish tint and is curiously mottled. It has a most unpleasant odour. Afghanistan and Persia is the home of the tree. It is used medicinally as an anti-spasmodic in cases of asthma.

NOTE ON SIREX JUVENCUS.

I SHOULD like to record the capture in Alton, Hants, of two fine specimens of the saw fly, (*Sirex juvencus*), male and female. The female was taken September 1888 in Mr. Monk's chemist's shop, and the male on the ground in the High Street last summer. Both specimens were kindly given to me by the captors, and were alive at the time. This species of saw fly does not appear to be very abundant, and certainly is not so numerous as *Sirex gigas.* This is the first, and only two specimens of *S. juvencus* I have had the pleasure of seeing, although I have been on the look-out for them some time.

At the same time, my opinion is that *S. juvencus* is British, and probably in some localities is more plentiful than in others. *Sirex gigas,* the largest of these saw flies, is frequently taken in this neighbourhood, and many specimens (all females) I have had brought and sent to me by friends, for the hornet. I found one pinned on my front door; and on another occasion one was sent me securely fastened up with string in a paper box labled "Mind the sting." "Well," thought I, "what now?—hornet?"

I carefully opened the box, peeped in, and—oh, my!—not a hornet, but a fine female *S. gigas,* with her long needle-like ovipositor, which had been taken for the sting of a hornet. The male of this species I have never seen alive. At the same time *S. juvencus* was taken in the chemist's shop, *Rhyssa persuasoria,* one of the Ichneumonidæ, was captured in the grocer's shop of Mr. Butler, in this town; and this came into my possession.

It is very fine specimen measuring from head to extreme point of ovipositor $2\frac{3}{8}$ inches. The ovipositor alone is $1\frac{3}{8}$ inches long, a fine instrument to probe timber for wood-boring larvæ, in which to lay its eggs. Can any of our correspondents say to what extent these saw flies are injurious to fir timber? Will they attack healthy standing trees, or only the sickly ones, fallen timber, and fir-fencing? Some years ago I had an old fir post brought me completely honey-combed by larvæ of *S. gigas;* and towards the outside of post were specimens of the saw fly ready to emerge. To all appearance the saw fly had laid its eggs in the post. I am quite aware that it is the opinion of some, that the fly does not attack the healthy trees, but only the dead ones. If those of our correspondents who live close to fir plantations would make a few observations, and make them known through the medium of SCIENCE-GOSSIP, we should get a good bit of valuable information.

J. BOGGUST.

LEFT BEHIND.

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

THE joints and sweets had been removed, and a fine piece of cheese—whether Gruyère, Gonçales, or other, I am not connoisseur enough to determine—but at any rate, a handsome, speckled green and white piece of cheese was brought on, whereupon our garrulous friend at the head of the table broke forth. "I saw such a thing the other day as I never saw before in my life. What funny stuff cheese is under the microscope!"

Now I pride myself upon being rather clever at the microscope, and I felt convinced that my friend the cheese-parer had not been looking at cheese under the microscope. Its pasty form presents no attractions like those of the bonnie wee mites which the cheese-fancier likes to hear crack, crack between his teeth, as he takes a morsel of the most lively portion and devours it after dinner as an antidote to indigestion. I therefore ventured to suggest to my friend that perhaps he had been inspecting some cheese-mites. Exactly so!

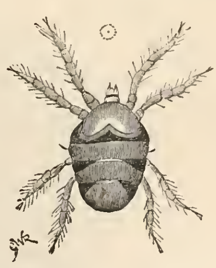

Fig. 108.—Willow-mite (*Tetranychus salicis*). The dot within the ring represents the natural size.

Fig. 109.—Elm-mite (*Tetranychus ulmi*).

I am naturally a modest man, but I saw that this was a golden opportunity for descanting on the wonders of visible and invisible things; and as my host and his circle of acquaintances assured me after the conversation was over that it had been immensely interesting, the way in which certain things get left behind in the race of life, is that which these innocent mites afford us."

"Indeed, I never care to see a piece of live cheese now," said my friend. "This is a case in which 'a

[Fig. 110.—Stone-mite (*Tetranychus lapidus*). From Taylor's "Playtime Naturalist."

Fig. 111.—Under side of *Arrenurus perforatus*. Male (highly mag.).

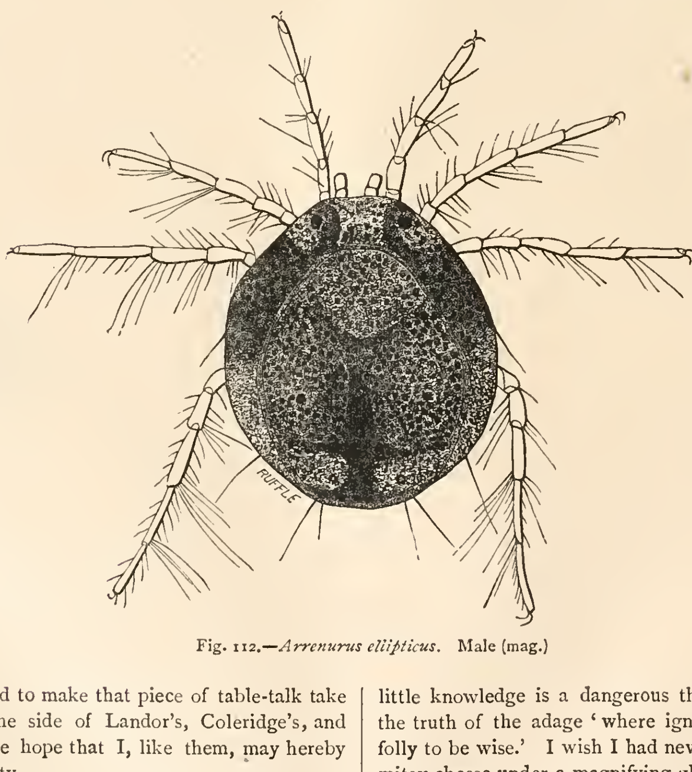

Fig. 112.—*Arrenurus ellipticus*. Male (mag.)

I have ventured to make that piece of table-talk take its place by the side of Landor's, Coleridge's, and Luther's, in the hope that I, like them, may hereby gain immortality.

"A wonderful instance," I began to explain, "of

little knowledge is a dangerous thing,' and I grant the truth of the adage 'where ignorance is bliss 'tis folly to be wise.' I wish I had never seen a piece of mitey cheese under a magnifying-glass."

I thereupon undertook to prove to him that even a cheese-mite would make a capital text for a parson (I speak sympathetically), by preaching him a most convincing sermon. By way of variation and illustration I begged that he would obtain without delay a most entertaining volume entitled "The Playtime Naturalist," and turn to the chapter which deals with mites, then come to my laboratory to see the identical

motion. We may call the six-legged stage the larval condition, but if you wish to be deemed scientific, pray use the word Hypopus stage. That magic word will admit you at once into the front ranks of scientific literates. This larval condition, be it understood, was once regarded in a very different light. Many a battle has been fought over a six-

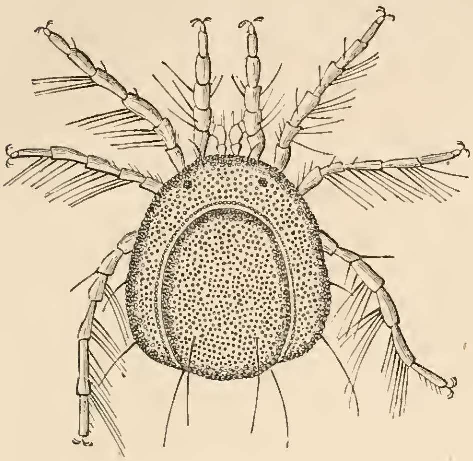

Fig. 113.—Female of Arrenurus (mag.).

Fig. 114.—*Arrenurus truncatellus* (mag.).

Fig. 115.—*Arrenurus integrator* (mag.).

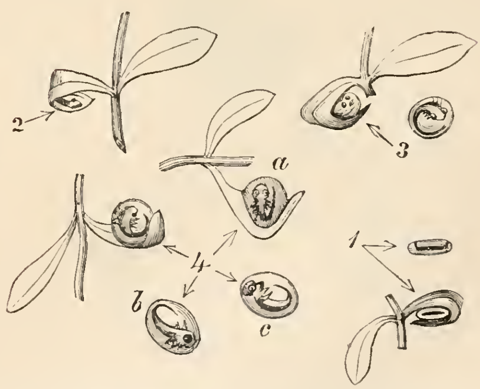

Fig. 116.—Single eggs of Newt, wrapped in leaves, showing development. From "Playtime Naturalist."

creatures under the microscope. Here I promised to show him the different stages from the egg to the perfect creature, and then he would better understand my meaning.

"There is one thing," I continued, "which I wish to emphasize, and it is this; that when the mite is half-way between egg and imago it has only six legs, whereas the perfect creature has eight organs of loco-

legged Hypopus—the history of which has been duly chronicled by Michael in the 'Journal of the Linnean Society,' by Murray in 'Economic Entomology,' not to mention other authorities."

My profound learning quite took the breath from my friend and his other guests, so that they never attempted to interrupt me. As I seldom get a chance to speak, I took the opportunity to point out that when the mite has only six legs it corresponds with insects, whereas in its perfect state it belongs to the spider family. Thus the mites "in this respect connect the two great classes of Insecta and Arachnida:" "Playtime Naturalist," pp 70, 170.

"Wonderful! Wonderful!" exclaimed the company, though I believe they were all the time thinking more about the quality of the cheese than the quality of my sermon, which must have been unconscionably dry. However, I flattered myself that they were interested, and proceeded.

"This is not the only parcel that has been left

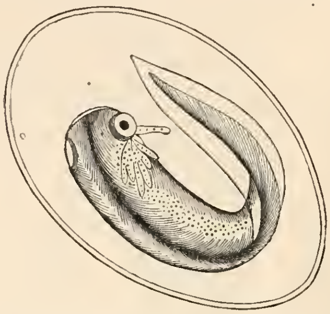

Fig. 117.—Development of Tadpole seventeen days after laying the egg.

Fig. 118.—Eggs of Stone-mite.

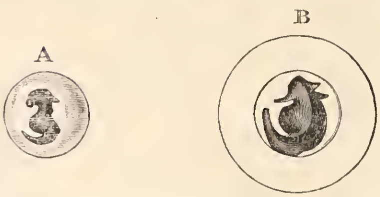

Fig. 119.—Segmentation of Tadpole's egg. A, fourteenth day. B, ditto, enlarged.

behind," I continued; and at a bound I passed from the mite to the frog. Whether my hearers knew the difference between a frog and a toad, I very much question, but it is well to flatter your hearers sometimes by assuming that they know as much as yourself, for no one likes to be considered a noodle, though he may be the essence of stupidity.

"Now," said I, "you know that when a frog's a tadpole it's a fish!"

"Never! Wonderful!"

"It is wonderful, indeed," I continued; and shameful as it must appear to the cool and philosophical outsider, I forthwith proceeded to preach a second sermon on things left behind. How far I succeeded I know not, but I endeavoured to show that when a frog lays its spawn there comes forth from each lump of jelly a tiny fish—scarce, if at all different from the young begotten by a salmon or a cod so far as the structure or anatomy is concerned—with gills instead of lungs and a tail for swimming instead of legs. I then showed how in due course the fish was left behind, and the creature, while still retaining its tail, improvised first one pair of legs and then a second until it stood on a par with the newts. Finally, I referred to the perfect animal, and showed how it gradually absorbed its tail, until it stood before us a beautiful and rational frog.

My friends naturally wanted to know where all this was leading, and I explained that such facts had led the naturalist to theorize as follows:—Many animals—and plants as well in a less degree—undergo a series of changes in their progress from the germ to the adult. At various stages they correspond to animals whose development is complete—the larval six-legged mite with the insect, and the larval tadpole with the fish—but eventually they pass beyond these forms and assume others which are different and higher. May not these stages indicate the lines along which the creatures have moved in their race-development? Or to put the question in the language of science, Does not the ontogeny of the creature recapitulate its phylogeny? ("Evolution," by Le Conte, p. 9 seq.).

I need scarcely say that mine host began to feel that he was out of his depth, and I had to tow him to land. This I did by explaining that so far as our present knowledge goes the doctrine of evolution is better adapted than any other which is at this moment before the public to meet all the difficulties associated with the questions of manifest life, while its inability to deal with the origin of life, makes it necessary for us still to revert to the Biblical doctrine of a wise and beneficent Creator.

NOTES ON NEW BOOKS.

POPULAR LECTURES AND ADDRESSES by Sir W. Thomson, F.R.S., &c., vols. i and iii. (London: Macmillan). The all-embracing science of modern physics owes more to Sir William Thomson, perhaps, than any living man. Sir William is not only an ingenious inventor and a patient and accurate discoverer, but a born teacher as well. As a lecturer he is too much in earnest to stoop to popularity, and he is careless about addressing any other than earnest students and workers. He expects them to take a little trouble to understand him, and they all know he is worth it. Readers of these addresses must be prepared to master a score or so of terms and phrases before they are admitted to the "Third Degree." Then Sir William's style, although terse and brief, is clear and understandable. That he can command a large circle of readers is evidenced by the fact that the first edition of the work under notice was soon out of print, and a second had immediately to be issued. Vol. ii of the set has not yet been published. Some of these Essays and Addresses have became classic, notably those in vol. i. on "The Size of Atoms," and "The Sun's Heat." Another lecture in three parts is devoted to "The Secular Cooling of the Sun," "The Sun's Present Temperature," and "The Origin and Total Amount of the Sun's Heat." Among other addresses are "The Six Gateways of Knowledge," "The Wave Theory of Light," "Electrical Measurements," "Capillary Attraction," &c. Many of these are supplemented by original notes and appendixes. The whole of these valuable discourses are included in one volume, entitled "The Constitution of Matter." Volume iii. is called "Navigation," and is devoted to navigational affairs. Among them we find the following comprehensive range of subjects discoursed upon in various chief places: "The Tides," "Terrestrial Magnetism and the Mariner's Compass," "On Deep Sea Sounding by Pianoforte-Wire," "Lighthouse Characteristics," "The Forces concerned in the Laying and Lifting of Deep-Sea Cables," "Navigation," &c. Many of these important summaries of valuable knowledge are also added to by original notes. Enough has been said, however, to show that the publication of Sir William Thomson's "Popular Lectures and Addresses" is a welcome addition to modern scientific literature.

The Birds of Essex—A Contribution to the Natural History of the County, by Miller Christy, F.L.S. (Chelmsford: Edmund Durrant). This is the second special memoir published by the Essex Field-Club—the most enterprising, active, zealous, and intelligent of our out-door societies. The author is a well-known, all-round naturalist, with a speciality for ornithology. He has long been a welcome contributor to the scientific press, some readers will well remember his name, although we miss the initial letter R in this his latest work. Ornithology is a branch of natural history which demands unusual patience and care; and, as a rule, none but enthusiastic ornithologists study ornithology. We are gradually acquiring a series of splendid and trustworthy monographs of British birds. In the eastern countries, particularly, we have Stevenson, Southwell, Babington, and now Miller Christy. The present work is got up with much taste. Most of the illustrations (162 in number) are first-rate specimens of natural history wood-cutting. Mr. Christy is known as a graceful and accomplished writer, and he also brings to his work all the requisites of a good ornithologist. His book is prefaced with a highly reliable and most interesting chapter devoted to short biographies of the principal Essex ornithologists. Next we have an account of the Chief Essex Bird Collections, Migration Tables (by Mr. H. Doubleday and the Rev. R. Sheppard), a chapter of Hawks and Hawking in the Olden Time (by Mr. J. E. Harting), and another on Wild Fowl Decoys and Wild Fowling in Essex. Lastly comes the chief part of the work: "A Catalogue on the Birds of Essex," which occupies over two hundred pages, and is abundantly illustrated. Every species of bird has some interesting note or item. This part is as attractive and instructing as many pages of Gilbert White. The Essex Field Club, through Mr. Christy's help, have conferred genuine assistance in the important work of constructing a national ornithology which will endure for many years to come.

Lessons in Elementary Biology, by T. Jeffery Parker, F.R.S. (London: Macmillan). We have by no means too many good manuals of biology. Zoology is indeed rather poor therein, and elementary botany is too abundantly represented. A general biology, based on the science of physical life, is open to good literary work. Professor Parker's handsome new text-book is of this character. It is meant for real students, not idlers or dilettanti skimmers of every fresh pot of scientific milk, although such people imagine they run away with the cream. For students in B.Sc. exams. this book is a genuine friend. The illustrations are numerous, well selected, and special. There is neither a needless nor a useless one in the volume. The table of contents includes thirty so-called "Lessons"; and it would be difficult to formulate a wider area of biological research and discussion. Professor Parker's method of instruction is clear, solid, and so strong that the student who has thoroughly mastered his "Lesson" will not be likely soon to forget it.

The Making of Flowers, by the Rev. Professor George Henslow (London: S.P.C.K.). Here we have another welcome addition to the "Romance of Science" series. Professor Henslow is the worthy son of a worthy sire. He is a devoted botanist, and was one of the earliest botanists to recognise the law of evolution in his beloved study. But he never seems to have taken kindly to the definite conclusions of Darwin, Hooker, Lubbock, and others, that insects are absolutely essential for crossing flowers. He rather holds a brief for the opposition, and thinks the plant travelled to the insect, rather than the insect to the plant—through its migrations. Mr. Henslow makes much of stimulation as an agent for effecting floral change, especially the stimulation of insects. We will not even endeavour, by sketching an outline of this charming little book, to rob our readers of the pleasure of perusing it.

The British Noctuæ and their Varieties, vol. i., by J. W. Tutt (London: Swan Sonnenschein & Co.).

The author has herein done good and laborious work in a field of research little known, but which offers much of importance and interest. The student has here collected ready for use the records of varieties hitherto scattered through numberless magazines. Nevertheless, much of the work recorded is new. Mr. Tutt is well known as a diligent lepidopterist, and this handy little manual will be highly acceptable to all working entomologists.

The Species of Epilobium occurring North of Mexico, by W. Trelease. Professor Trelease is in charge of the Missouri Botanic Garden, and this well got-up work forms the Second Annual Report of that Institution. It will be of much service to American botanists. It is illustrated by forty-seven artistically got-up plates of the different species of Epilobium.

Monographie du Genre Pleurosigma et des Genres alliés, by H. Perogallo (Paris : M. J. Tempère). This handsome monograph of the most important of all the genera of diatoms, owes its publication to the existence of "Le Diatomiste," the French botanical quarterly journal, edited by M. Tempère, devoted to the study of diatoms, to which we have already drawn the attention of our readers. It is illustrated by ten plates, quarto size, crowded with accurately drawn figures. M. Perogallo's work has involved much labour and research.

TWO VIEWS OF THE WEALD.

View the First.

THE long ridge of Kentish rag which bounds the Weald Valley on the north slopes steeply down to the bed of the Beult—a little tributary of the Medway, which meanders slowly through the rich corn-land, scattered copses and marshy meadows, which make the Weald dear to farmers and to sportsmen. The alluvial soil of its banks rests upon a bed of flinty gravel, laid bare in the river-bed and the ditches bordering the fields, and contributing more stones to the surface soil than is usual in a land where "stone-pickers" are unknown. These scattered flints will furnish us with the materials for reconstructing in our imagination the Weald as it once was—the home of beast and wild fowl, of hunters without gun or cartridge, trained setter or beagle, but whose weapons, of their own manufacture, doubtless did good execution in their day.

Step with me over the plank bridge that spans the Beult. There in the river-bank, not long ago, was found sticking out of the soil, a beautiful polished celt, an axe-head, whose owner little dreamed that the tool he fashioned and polished with such infinite toil and care should now alone represent to us the worker's life and ways.

When we have crossed the meadows, where the overflowing river deepens its deposit of silt every winter, we arrive at the edge of some ploughed fields, bare as yet of seedlings ; the soil in this curious "spring" weather is dry and crumbling after the ploughing and harrowing. At every step or so we may pick up a fragment of flint—satiny black, translucent grey or brown, glowing red, almost as jasper, weathered to a blue like that of the Kentish hills in the distance, cracked and calcined like a bit of old pottery—and of real pottery, too, we may pick up specimens, of which more anon.

The variety of colour in the flints is by no means their sole attraction or interest. Scarcely one of them but has been split or splintered, and that in no accidental manner. A practised eye soon recognises "flakes" and "cores," perhaps a fashioned arrow-head, borer, or other tool. Here was undoubtedly one of the earliest manufactories of which we have record—and these flints are the raw material, the refuse, or the finished articles.

Long ago the ever-working rain and frost and rivers and sea wore away the escarpment of those chalky downs which bound the Weald to north and south ; long ago the flints were drifted over the land, sole traces of the earlier deposits. The great Weald forest grew up, man appeared on the scene, and here, where fish and bird and beast must have found food in plenty, their newly arrived master found weapons also to his hand. Generations of the old stone-workers must have lived and died—hundreds of flints must have been chipped and shaped, and presently polished, and then "the old order" changed, newer races came on the scene, for as we trudge over the ground we can pick up from time to time pieces of well-burnt clay that are not bits of drain-pipes, nor specimens of modern art, but genuine Roman tiles, and Roman pots. And on the far side of the Beult, along the hill, stretches a long line of Roman earthworks, and in a copse half-way down is a still untouched tumulus, into which as yet only the rabbits have been privileged to burrow.

And so, as we homeward wend our weary but happy way, we may see in thought the savage hunters stalking their game, setting their snares or their nets, sitting over their fires after nightfall—ashes have been dug up in these very fields—shaping and polishing their tools, scraping their skins, fitting their bows, doubtless enjoying life as much as did those modern sportsmen whose many empty cartridge-cases now betoken a "warm corner." Doubtless the rabbits scurried and burrowed, as now in the soft loam, and the plover screamed over-head, and the larks rose into the cloudy sky wherever the wood was cleared—perhaps also the wolf and the bear and the wild boar ranged over the land. Much is changed, yet enough is the same—enough to make us sure that these our rude forefathers of the stone ages, had in many ways such a view of the Weald, as we may have to-day, if we will but look for it.

View the Second.

The Weald of to-day is rapidly getting prosaic: the iron horse and the jerry builder are penetrating into its depths, the primroses and ferns are fast vanishing from its hedgerows, the traction engine is replacing the labouring team, hedgerows themselves are giving way to iron fences, barbed as often as not, copses are being "grubbed," wayside trees cut down, strips of turf quietly absorbed into the nearest field, thrashing and ploughing, and milling done by steam, instead of by homely and slower methods, the smock-frock and the village curtsey are things of the past along the main roads—or at least wherever the rail has crossed them. It is worth while, therefore, to leave the land of transition, and see what remains of the old ways and the old places.

Anyone who visits the county town on a market-day will see drawn up in lines in the broad High Street carriers' vans and omnibuses of all sizes and degrees of gentility. In the course of the afternoon these will be labouring out of the town, laden with marketing folk and their baggage, and with many a parcel to be dropped at wayside inn or cottage.

Suppose we take an outside seat on one of these bound some fifteen miles or more into the heart of the Weald, where Tenterden, Biddenden, Hawkhurst, and all the other *dens* and *hursts* remind one of its former forests and bosky dells.

Slowly, slowly the pair of horses—hardly a pair—toil up the long ascent to the top of the limestone ridge. We travel south by east, and the keen north-east wind cuts across the fields, now faintly green with springing wheat, and raises clouds of dust, till the hedges are whitened as in July, though they are barely green enough for March.

The broad, flat-topped hill is crossed, the road winds down the steeper side, and we are soon on the level. We have passed one village well placed on the slope and grouped round its pretty church, whose stone spire is a land-mark for many miles. Our conveyance has stopped to refresh "man and beast" at a low-browed, timber-fronted inn; many a greeting has been exchanged with passers-by, and now we set off with quicker pace to cross the flat valley, through which the railway runs straight as an arrow from Tonbridge to Ashford. Sycamores and horse-chestnuts are just budding, meadows are getting "a bite" on them for the numerous lambkins, and here and there starry anemones or celandines grace shaw or bank. In cottage-gardens the "lent lilies"—all out of date—are nodding in the breeze; the characteristic cottages, steep in front and sloping low behind, like the hills, show budding pear and plum-trees; over a wayside-pond are the first swallows skimming; and our onward movement is impeded here and there by those of sheep and cattle from a country-market. One frightened little calf slips between our horses. "Three abreast," jocularly remarks the driver; but he pulls up in time to save it a blow or scratch. All this is commonplace enough; but the level fields, the winding road, the luxuriant hedgerows, the leisurely movements of everybody give a sense of peace and rest not always easy to find nowadays.

We have crossed the railway, exchanged inside passengers and parcels, and off we go again, due south now, leaving the valley behind, and mounting one after another the sandstone slopes which lead gently up to the South Downs.

Corn-fields, hop-gardens, and "oast-houses," grow fewer, meadows and woods and heather-covered banks more numerous, till at last a tall windmill, a solid, square church-tower, and many brown-tiled roofs betoken our destination—a little old-fashioned town, innocent of railway, and living its life of gentle measured bustle with a grace that is quite charming.

Next morning, as we sally forth from our comfortable quarters at a real old-fashioned inn there is a choice of many roads. We take one which leads southward, and find with delight that though Primrose Day has come and gone, the primroses in hot, damp, wayside copses and hedgerows are still waiting to be picked, that wood-sorrel and moschatel peep from the shady nooks, and milk-maids, violets, and celandines deck the sunny stretches.

We stop towards noon at a trim farmhouse, all red brick and tile, with ample store of hay still in its rick-yard. The ponderous knocker brings out the farmer himself, in working clothes. He is pleased to tell the way; but a request for milk brings the good-humoured explanation that it is all in the creaming-pans. "If you'd 'a come in the morning or evening milking-time now—" But the laws of the dairy are those of the Medes and Persians, and we turn thirsty away. We have noted, however, the bees humming in and out of chinks in the weather-tiles. "Yes," he says; "we took out more 'n a hundred-weight o' comb last year." We wonder to ourselves what it must be like to live in such close quarters with the busy little folk.

Up hill, down dale, over field and stile and five-barred gate we make our way. A labourer taking his nooning under a haystack shows us a cross-cut, and we feel that we have lighted upon a land where nature still has a good deal of her own way.

For our evening stroll there are the wide woods, where thrush and cuckoo and pheasant greet us with their songs and calls, and where the moor-hen splashes in a lonely pond.

When the last red sunset-gleams have glorified the fir-trees a clear moon shines over the gabled houses, fewer and fewer footsteps echo on the rough pavements, soon they cease; and at old-fashioned hours the old-fashioned folk seek their (doubtless) well-earned slumbers.

Call it dull if you will: to those whose eyes and ears are open, such a life in such surroundings has much of the keenest interest—it is that of our England unadulterated. Let us enjoy it while we may.

M. E. POPE.

NOTES ON THE MODIFICATIONS OF ROOTS.

THE axile roots, such as the conical tap-roots, which occur in *Aconitum napellus*, *Peucedanum sativum*, and *Daucus carota*, are a direct prolongation of the stem; as also the fusiform tap-root of *Raphanus raphanistrum*, and the napiform tap-root of *Brassica rapa*. The contorted root of *Polygonum bistorta*, and the premorse root of *Scabiosa succisa*, seem to be only modifications of the rhizome, but are sometimes mistaken for true roots.

The tuberculated roots, as the palmate tubercules of *Orchis maculata*, are only formed by the enlarging

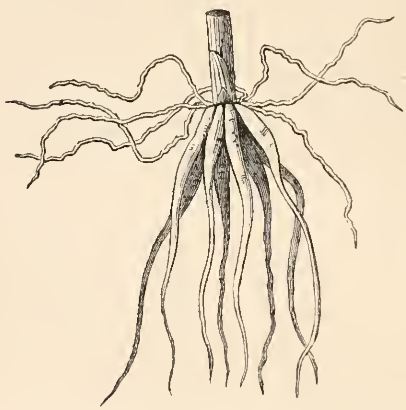

Fig. 120.—Abnormal Tubercules of *Orchis maculata*.

of several adventitious fibrous roots which have cohered at their bases, and left their extremities free, which forms the divisions of this kind of tubercule; those adventitious roots which ascend from the junction of the tubercules with the stem have slightly enlarged, but otherwise preserved their primary form; this may be ascertained by a specimen I found in Sussex in 1890, which had no perfect tubercules, but had in their place several adventitious fibrous roots which should have cohered and formed the two tubercules; all these fibres were a little swollen at their upper ends.

The ovoid tubercules of Herminium, Ophrys, and Aceras, etc., are formed by complete cohesion of several fibres, or by the enlarging of a single one. In the fasciculated roots of *Ranunculus ficaria*, this same enlarging of some of the adventitious roots is obvious; on a single plant may be found all the modifications from a fibrous adventitious root to a fasciculated, or even ovoid tubercule. The dahlia exhibits another form of adventitious fasciculated roots, where several of the fibrous roots have cohered and formed an elongate ovoid tubercule, the ends only are left free at the extremities of the tubercules. In *Œnanthe pimpinelloides* and *Spiræa filipendula* we have the nodose adventitious roots; in the former species we have the swelling about the middle of the fibre, while in the latter it is near its extremity; in *Œnanthe lachenalii*, the fibres are but slightly swollen,

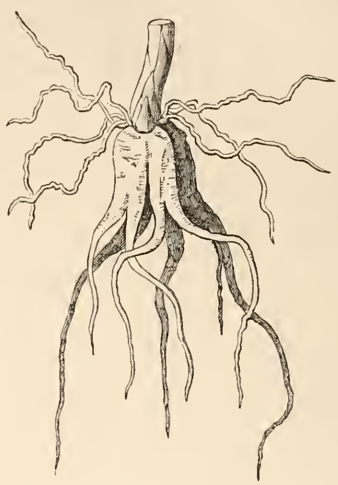

Fig. 121.—Palmate Tubercules of *Orchis maculata*.

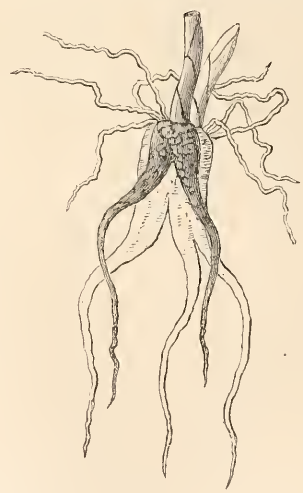

Fig. 122.—Palmate Tubercules of *Orchis maculata*.

which must have been the primary of those of *Œ. pimpinelloides*.

It seems that the stem was the primary form of roots, since all roots have more or less the structure of stems; those roots so different from the stem modifications, may only have lost their structure with time.

HENRY E. GRISET.

BOTANICAL RAMBLES NEAR ROUNDSTONE, COUNTY GALWAY.

THE district I am about to describe is situated near Roundstone, a small town on the south-west coast of Connemara, about fifty miles by road from Galway. Immediately to the west of the town is Urrisbeg, a hill of nine hundred and eighty-seven feet in height, the slopes of which, and the lakes and bogs about its base, are all very rich in rare plants.

The hill is composed of granite, and is rather remarkable for the number of metallic ores it contains, viz.—gold, silver, copper, lead, and molybdenite. But I think some of them are in too small quantities and too much diffused to pay for extensive mining operations.

I visited this locality last June in company with my friend, Mr. J. G. Wells. We arrived there on the 29th, from the Aran Islands.

The next morning we started botanising, and were much struck with the profusion of *Osmunda regalis* growing on the banks of all the streams and ditches. It was of all sizes from a few inches to three or four feet in height; very fine indeed it looks, with the light green fronds topped with a large brown spike of of sporangia. This seems to be one of the commonest ferns in Connemara; I noticed it in most of the ditches along the roadsides.

Soon after we started to ascend the hill, we found the lovely *Dabœocia polifolia* in flower. This plant is confined to the west of Ireland, and is one of the most gorgeous of our Ericaceæ, its crimson flowers are in some cases nearly three-quarters of an inch long. There is also a white variety to be found about here, but we were not fortunate enough to see it.

Pinguicula lusitanica was found growing on boggy ground a short distance up. It is a most delicate little plant, the leaves are very pale with darker veins; the flower is lilac, also with darker veins. The whole plant is very fragile, and much smaller than *P. vulgaris*, which we found growing with it. The plants of this genus are very interesting from the fact that they are insectivorous.

Other plants worth mention are *Schœnus nigricans*, which is very conspicuous, with angular-looking heads of black glumes; *Eriophorum angustifolium* (the cotton-grass); *Scirpus pauciflorus*, and *Carex limosa*.

We also found a thistle which, I think, is a hybrid between *Carduus palustris* and *pratensis;* but we did not see either of these species anywhere in the locality.

All the above were growing on the boggy slopes of the hill.

On reaching the top of Urrisbeg a very striking view meets the eye. Looking north we could see nearly three hundred lakes, both large and small, all clustered together in the space of a few square miles; houses and cultivation are conspicuous by their absence. To the westward stretches Slyne Head with the two lighthouses on the island at its extremity. To the southward we could see Deer Island and numerous others, further out to sea the three islands of Aran; along the coast of these latter could be seen the smoke arising from the numerous fires of the kelp-burners.

The next day (July 1st) we took a route around the base of Urrisbeg.

In some small pools on a peat bog we found *Utricularia minor* and *U. intermedia* growing in abundance. The former was in flower; they are supported on a very fine stalk, and stand a few inches out of the water; the bladders and leaves are on the same stem. In the latter species the bladders are very large and on separate stems from the leaves; it is very distinct from all the other species of the genus.

Both these plants are insectivorous, and in the bladders of *intermedia* I found numerous minute fresh-water crustaceans, etc.

Growing with the above was *Chara fragilis* in full fruit.

On the peat of these bogs were found all three species of *Drosera*, viz., *rotundifolia*, *anglica*, and *intermedia*. This is also a most interesting genus, from the fact that all the species are insectivorous, and I found some plants with two or three of the leaves each making a meal off an insect. Some of the plants of *anglica* were very fine, the leaves of this species are more erect than those of *rotundifolia*, and are therefore very conspicuous among the bog-moss. After leaving this boggy ground we went over a spur of the hill and down into a little valley, on the slopes of which was growing *Erica mediterranea*. This spot and one in County Mayo are its only British habitats; we were unfortunately too late for the the flower. I only found one small sprig with two or three flowers on it; but when in full bloom it must be a beautiful sight, judging from the large quantity of withered flowers we saw. Growing about this place was *Saxifraga umbrosa* (London pride); this is only found truly wild in Ireland.

From here we went on to Lake Bollard, one of the larger ones seen from the top of Urrisbeg. There is a spot near here where the true British maiden-hair fern (*Adiantum Capillus-Veneris*) grows, and I should think out in this wild part, nearly fifty miles from a railway station, it will be out of the reach of the Vandal tourist for many years to come. It does not grow very large here; the specimens we saw were only a few inches high.

At the place we first struck the lake is a little cove with a sandy strand; here we started dragging for aquatic plants, and were very well rewarded for our trouble, almost the first haul brought to land a specimen of the rare *Eriocaulon septangulare*, a most curious little plant with awl-shaped leaves, of a peculiar cellular structure; these arise from a crown on a creeping root-stock; the roots also exhibit an annular structure very distinctly. We were not fortunate enough to find it in flower. Growing with the above was *Lobelia dortmanna;* this is a rather curious plant, all the leaves are under water; the flower-stalks stand up several inches above the surface, bearing a few lilac flowers. At a distance they have the appearance of dead straws standing in the water.

Another plant the drag brought up was *Scirpus fluitans.* This varies very much with the depth of the water; in some specimens I found the branches were as thin as horsehair, and others, in shallower water, considerably thicker.

Arctostaphylos ura-ursi, was found trailing along the ground close to the edge of the lake. On our way back to Roundstone across the bogs, we came to a small stream of deep water, which was covered with *Nymphæa alba;* between twenty and thirty of its beautiful white flowers were floating in the space of a few square yards. It abounds on most of the lakes, &c., in this part of Connemara.

Samolus valerandi, Habenaria chloroleuca, and *Carex stricta,* were also observed.

July 2nd. We went along the heaths and bogs by the side of the road that runs from Roundstone to Clifden. On a slightly elevated heath about five miles along, we found the rare *Erica Mackayi,* growing in fair quantity. It is easily distinguished from *E. Tetralix,* by the reddish tips of the branches and the more ovate leaves. I found some forms of *Tetralix* that come very near to this species. While speaking of heaths I may say that we found white varieties of *Tetralix* and *cinerea.*

Cladium germanicum was found growing by the side of a small lake near this spot.

July 3rd. This day we drove from Roundstone to the picturesque group of mountains known as the Twelve Pins, a distance of about eight miles. On arriving there we at once started to ascend the nearest, which is rather steep all the way up. The only plants worth notice we found on the lower part were *Thalictrum minus* and *Carex pulicaris.* The flora of these mountains is most scanty; we went to the top of three of them, and the only plant we thought worth taking was *Saxifraga umbrosa;* this was very various in form and size, some plants only about $1\frac{1}{2}$ inches in height, and others as much as 1 foot. Our labours were rewarded in another way this time, for on reaching the top (over 2,000 ft.) there was a most splendid view of the whole coast-line from Achil Head on the north to Loop Head on the south.

As the day was perfectly clear and bright we could make out, with the aid of our map the islands of Clare, Inishturk, Inishbofin, Inishark and Aran besides numerous smaller ones.

On the descent we followed the course of a small stream flowing in a deep bed with very steep banks. Along this we found *Dabœocia polifolia* very large, and in some spots in great quantity; also some of the hybrid thistles. So after a hard day, we had done very little botanical work, and were glad to get back to our car, which had been "put up" by the road-side, and drive back to Roundstone.

Next day we drove to Galway by the mail car, in time to catch the night train for Dublin, en route for Burton.

JNO. E. NOWERS.

Burton-on-Trent.

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. BRUNETTI.

[*Continued from p.* 131.]

IN my introductory remarks on existing collections in the first portion of this paper, I mentioned the unsatisfactory state of the British Museum Collection, but I can now, with much pleasure, retract that statement, as a new and able assistant (Mr. Austen) has been added to the staff, and under his indefatigable efforts the Collection is being rapidly overhauled and properly arranged.

29. *Muscidæ.*

Over 800 species of this immense family are known to be British, and ere long the list will probably exceed a thousand, as over 4000 European species (nearly half the total number inhabiting Europe) belong to it, and there are probably 30,000 species distributed over the world. The venation is very similar throughout the whole group, the genera in which it varies most belonging to the group Acalyptera̲ta.

Six sub-families are universally recognised.

Alulæ large (*Calypterata*).
- Fourth longitudinal vein (from just beyond external transverse vein) bent up towards tip of third.
  - Arista bare (in some genera pubescent): *Tachininæ.*
  - Arista pubescent.
    - Arista bare from the middle to the tip: *Sarcophaginæ.*
    - Arista pubescent to the tip.
      - Abdomen conical, covered with long spines—legs rather long: *Dexinæ.*
      - Abdomen rounded, no spines, legs rather short: *Muscinæ.*
- Fourth longitudinal vein not bent up towards the third, and diverging from it towards the tip: *Anthomyinæ.*

Alulæ small or absent (*Acalypterata*).

The arista is the antennal style—usually long, and seated on the upper side at the base of the third joint.

The antennæ in the calypterate *Muscidæ* are usually pendent, lying close together in the centre of the face—the arista being generally horizontal.

A very slight acquaintance with the *Muscidæ* is sufficient for the student to recognise at a glance the sub-family to which any specimen belongs.

(1.) *Tachininæ.*

This is an exceedingly difficult group to study, the species being so closely allied, variation being common and the published matter so scanty and exceedingly unreliable.

R. Desvoidy, Walker, and some other authors have

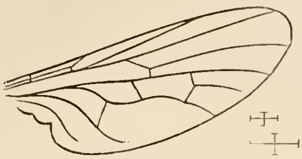

Fig. 123.—*Rhamphomyia*, Mg.

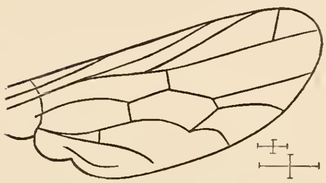

Fig. 124.—*Empis*, L.

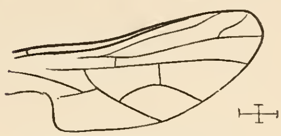

Fig. 125.—*Hilara*, Mg.

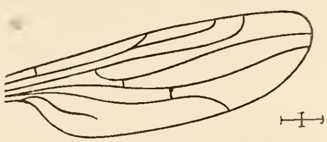

Fig. 126.—*Tachydromia*, Mg.

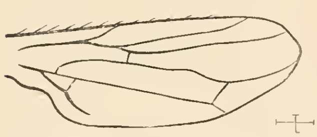

Fig. 127.—*Dolichopus*, Latr.

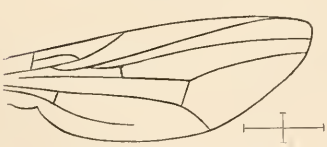

Fig. 128.—*Hydrophorus*, Uhlbg.

created hosts of new species on minute differences, and their names are being sunk wholesale as synonyms as the group becomes better known.

Walker's *Tachinidæ* in his British Diptera are hopelessly indeterminable, his descriptions of this group being of no scientific value whatever.

Most of the *Tachinidæ* are parasitic on larvæ (especially *Lepidoptera*, the genus *Cucullia* being a particular favourite). Serville reared eighty specimens from one *Acherontia atropos* larva. Dufour, Winthemi, Curtis, St. Fargeau, Bouché and others record observations of their parasitic habits.

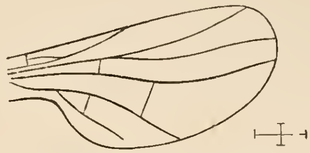

Fig. 129.—*Medeterus*, Fisch.

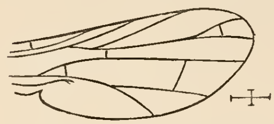

Fig. 130.—*Clinocera*, Mg.

Fig. 131.—*Lonchoptera*, Mg.

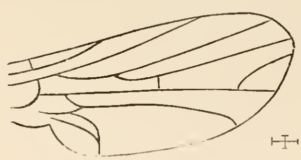

Fig. 132.—*Platypeza*, Mg.

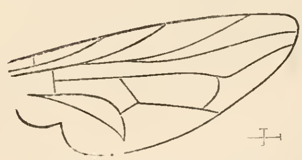

Fig. 133.—*Pipunculus*, Latr.

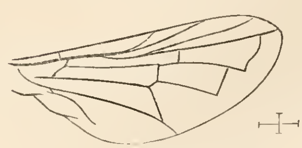

Fig. 134.—*Chyrsogaster*, Mg.

The flies are usually found in dry, warm habitats and on *Umbelliferæ*, and are easily recognised by the long, conspicuous spines and bristles that cover the body and legs in nearly all the species. The legs are very brittle and easily broken.

Five subdivisions are generally recognised.

Abdomen quite bare.
- Abdomen five or six-segmented, flat, wings broad and large—triangular: *Phasinæ.*
- Abdomen four-segmented, globular, wings of normal shape, rather small: *Gymnosominæ.*

Abdomen pubescent, large spines nearly always present.
- Abdomen five-segmented, long—genitalia very prominent.
  - Fourth longitudinal vein meeting third some distance from edge of wing, fifth meeting fourth much beyond middle of first post. cell: *Ocypterinæ.*
  - Fourth longitudinal vein meeting third nearly at edge of wing, fifth meeting fourth before centre of first post. cell: *Phaninæ.*
- Abdomen four-segmented, conical, genitalia not prominent: *Tachininæ.*

The principal genera are *Echinomyia*, Dumer, *Nemoræa*, Desv., *Exorista*, Mg., *Tachina*, Mg., and

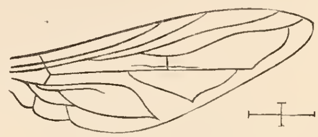

Fig. 135.—*Syrphus*, F.

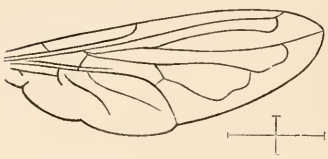

Fig. 136.—*Volucella*, Geoff.

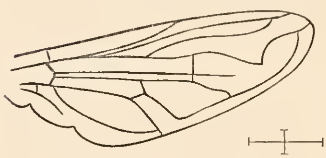

Fig. 137.—*Eristalis*, Latr.

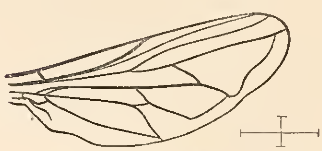

Fig. 138.—*Criorrhina*, Mcq.

Phorocera, Desv., but the state of our knowledge of the group is at present highly unsatisfactory.

Echinomyia grossa, L., is one of the largest British flies, and is a large black bee-like fly covered with soft black hair; face, front and back of the head yellow, with short bright golden pubescence; antennæ tawny, tips black; legs black; wings pale grey, tawny at base and on the fore-border; long 12–15 mm.

Olivieria lateralis, F., abdomen tawny, with a central dorsal black stripe enlarged towards the tip, and covering the whole of the last segment; thorax black with indistinct grey stripes; face and front silvery grey; antennæ and legs black; wings pale grey, brownish on fore-border; long 7–8. Common in long grass.

Exorista vulgaris, Fln., is a tessellated black and grey fly, subject to much variation; wings clear; face silvery-grey, with a central broad brown band; antennæ large, long, black; legs black; alulæ large, white; long 7–8 mm. Most of the genera are represented by two or three species only.

Nemoræa occurs chiefly in woods.

Gymnosoma, Mg., and *Clytia*, Desv., frequent the carrot plant.

In *Myobia*, Desv., and *Metopia*, Mg., the ♀ lays her eggs on the dead insects brought into Hymenopterous nests as food.

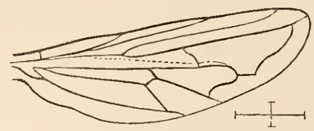

Fig. 139.—*Xylota*, Mg.

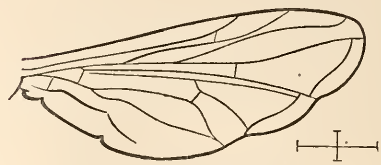

Fig. 140.—*Chrysotoxum*, Mg.

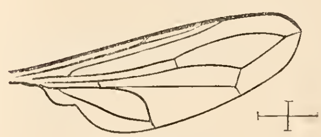

Fig. 141.—*Conops*, L.

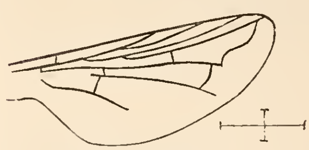

Fig. 142.—*Œstrus*, L.

Tachina, *Masicera*, *Exorista*, *Nemoræa*, *Echinomyia*, and others are known to be parasitic on Lepidoptera, Serville thinking that *Nemoræa* is also parasitic on Lepidopterous pupæ.

Gonia, Mg., is represented by five species, none common; the face is very broad.

Trixa, Mg., somewhat resembles *Sarcophaga;* three species, larva unknown.

Alophora hemiptera, F. Pauz. lxxiv. *Echinomyia ferox*, Pz., Pauz. civ. *Trixa variegata*, Mg., Wlk. ii. Pl. xii. 3. *Gymnosoma rotundatum*, L., Wlk. ii. Pl. xi. 6. *Ocyptera brassicaria*, F., Curt. 629.

(2.) *Dexinæ.*

This small group is closely allied to the *Tachininæ*, and calls for no special mention; about twenty species are British, nearly all representing a different genus each; of *Dexia* we have five species. The larva of the *Dexinæ* are chiefly parasitic on Lepidoptera; the flies frequent flowers and dry, warm spots, and are often found in woods.

In Desvoidy's splendid work on the "Myodaires," he gives a lengthy list of the species of *Tachininæ* and *Dexinæ* that are known to be parasitic, with the species of insect infested.

As a rule the abdomen is longer and more pointed in this group than in the *Tachininæ*, and as in that group the legs are brittle and easily become detached from the body.

Prosena siberita, F., Curt. 665. *Thelaira leucozona*, Pz., Pauz. civ.

(3.) *Sarcophaginæ.*

Dr. Meade, a few years ago monographed the British species of this group, which number about twenty, all (with one or two exceptions) being closely allied and exceedingly difficult to identify.

They breed in decaying animal matter, occasionally in dung. The imagos usually have tesselated black and grey abdomens—with strong spines towards the tip. The thorax is usually longer than it is broad.

Cynomyia mortuorum, L., is a large, bright blue fly which breeds in the putrid corpses of animals, generally dogs; appearing in April and May. The face is bright golden yellow; the legs black; wings nearly clear. It is not common here, but is frequently met with on the Continent; long 8–12 mm.

Sarcophaga, Mg., is a genus of flies, in which the thorax and abdomen are divided into tessellated squares, the wings are pale grey, the legs black; and the thorax, abdomen, and legs covered more or less with spines, the number, length and position of these spines being important specific characteristics.

S. carnaria, L., the commonest species, is known as the "flesh-fly."

In some species the extreme tip of the abdomen is bright red. The ♀ in this genus is viviparous, 20,000 larvæ having been found in a single specimen.

(4.) *Muscinæ.*

The flies of this group are the greatest scavengers of the order, the larvæ living in decomposing animal matter and devouring nearly all the fleshy part of the carcase. Sometimes they breed in dung.

About thirty species are British, many very common.

The principal genera may be separated thus:—

Proboscis horny, projecting horizontally, prominent: *Stomoxys*, Geoff.
Proboscis soft, vertical, not prominent.
  Fourth longitudinal vein at its bend upwards not forming a sharp angle.
    Middle tibia spined along its length: *Mesembrina*, Mg.
    Middle tibia spined only at tip: *Cyrtoneura*, Mcq.
  Fourth longitudinal vein at its bend upwards forming a sharp angle.
    Species non-metallic.
      Middle tibia spined along its length: *Calliphora*, Des.
      Middle tibia spined only at tip: *Musca*, L.
    Species metallic green: *Lucilia*, Des.

Lucilia, Desv., is a genus of bright metallic green flies, the face being usually black or green, the wings nearly clear.

At least six species are British, all more or less pubescent, and all very closely allied; long 5–10 mm.

L. Cæsar, L., and *L. cornicina*, F., are the two most common species, appearing everywhere; the latter being easily known by its bright green face. These flies are sometimes known as "green-bottles."

Calliphora erythrocephala, Mg., is the common meat-fly or "blue-bottle;" a closely allied species, *C. vomitoria*, L., has a red beard. The progeny of this fly is said to amount to 500,000,000 in twelve months; and Mr. B. Lowne, who has made this species a study for many years, asserts that in the imago "not one structure exists as it exists in the maggot."

Musca domestica, L., is the common house-fly. Black and grey, with rather tawny sides to the abdomen; antennæ, legs, and eyes black; wings clear; thorax black, with grey stripes; face silvery; long 5–7 mm.

Mesembrina meridiana, L., is a rather large black hairy fly, with black snout and golden yellow cheeks; black mouth and eyes, black legs, grey wings, tawny at the base and along the fore-border; not uncommon; local; long 10–11 mm.

Stomoxys calcitrans, L., is easily recognised by its strong, prominent proboscis. About the size of *M. domestica*, the abdomen being greyish with black markings; usually found on sunny days on leaves and wooden posts; it follows horses in numbers, and causes much irritation by its bite; long 6 mm.

Cyrtoneura stabulans, Fln., greyish, with pale brown reflections, larger tham *M. domestica*, common everywhere, especially in houses.

It has been bred from shallot, but the species in all probability breeds in a variety of substances.

(5.) *Anthomyinæ.*

Of this extensive group of closely allied species, we have over 200 species. In many species it is impossible to identify the ♀, the specific characters being confined to the ♂.

The larvæ of many species are leaf-miners, others live in the stalks of plants, in fungi, decomposing vegetable matter, &c., and damage the crops to no inconsiderable extent.

Dr. Meade published in the "Ent. Month. Mag.," vol. xviii. (1881), a series of articles on this group, and in the number for Oct. 1883, gives an analytical table of the higher genera of *Anthomyinæ*. This group is eminently a very difficult one to classify satisfactorily as many of the generic characteristics are sexual, and such weak characters as the colour of the legs has been fallen back upon as distinguishing points.

One or two well-marked groups may be distinguished, (as *Hydrotæa*, *Homalomyia*, &c.,) and the principal genera may be recognised as follows:—

Alulæ of moderate size, scales of unequal size.
- Front femora in ♂ toothed, third and fourth longitudinal veins convergent: *Hydrotæa*, Des.
- Front femora normal, third and fourth longitudinal veins parallel or diverging.
  - Eyes pubescent: *Hyetodesia*, Rond.
  - Eyes bare.
    - Abdomen spotted.
      - Arista feathered: *Spilogaster*, Mcq.
      - Arista pubescent or bare: *Limnophora*, Des.
    - Abdomen unspotted.
      - Anal vein nearly reaching border of wing.
        - Arista feathered: *Hydrophoria*, Des.
        - Arista pubescent or bare: *Anthomyia*, Mg.
      - Anal vein very short, curved towards the axillary vein: *Homalomyia*, Bouché.

Alulæ small; scales of equal size.
- Arista feathered: *Hylemyia*, Des.
- Arista pubescent or bare: *Chortophila*, Mcq.

Limnophora, Des., comes chiefly from Scotland.

Hydrotæa dentipes, F., is a dark grey fly, with greyish reflections; pale brown wings; black legs and silvery cheeks, and is common in most parts; variable; long 9 mm.

Drymeia hamata, Fall., may be easily recognised by its strong hooked proboscis.

Hylemyia strigosa, F., is a bristly grey fly, the dorsum of the thorax being pale brown, distinctly marked off from the lower part of the thorax; abdomen grey, with a dorsal and three transverse black stripes; face silvery seen from above, black viewed from below; mouth and antennæ black; eyes reddish-brown; wings pale grey; legs blackish, tibiæ more or less dark tawny; common, especially in woods; variable; long 6 mm. One species (*H. coarctata*, Fall.) damages the wheat crop whilst in the larval state, attacking the stalk.

Anthomyia radicum, L., ♂, is a small black fly, breeding in cabbage and other like plants; abdomen dark grey, with a dorsal and four transverse black stripes; face and legs black; wings pale grey; eyes often with a silvery border; very common on low herbage and in London gardens; long 4 mm.

A. sulciventris, Zett., is also common everywhere, the ♂ is a nearly black fly, with unmarked abdomen. The ♀ is greyish-black, with unmarked abdomen.

Caricea tigrina, F., common in long grass; bristly, grey with rows of black spots on the thorax, each giving forth a bristle, and with four brown spots on the abdomen; legs black with tawny tibiæ; face grey with a broad central stripe; eyes and antennæ black; wings pale grey; variable; long 5-6 mm.

Chortophila, Mcq., an extensive genus of small flies allied to *Anthomyia*, many being tolerably common; some of the species being parasitic on wild bees, Dr. Meade having taken them in the nests of the latter.

Homalomyia canicularis, L., is very common in houses; ♂ blackish-grey; abdomen tawny, divided by a dorsal and two transverse lines into six squares, tip blackish; face silvery white, with a central black stripe; wings pale grey; legs blackish; variable; long 4-5 mm. The males of this genus hover together in the air in a group, sometimes for hours together, and are often seen in rooms in early morning hovering below the centre of the ceiling or near the windows.

This species and another of this genus have been bred from the human body.

Hylemyia coarctata, Fln., in the larval state does considerable damage to the wheat crop.

The larva of *Cœnosia*, Mg. (allied to *Caricea*), lives in cow-dung.

Over a dozen genera are represented by only one or two species each. In several of the less developed genera the eyes are widely separated in both sexes, thus approaching the acalypterate *Muscidæ*, from which they are scarcely structurally distinct.

Plates are not of much value in this group, except to illustrate genera or very characteristic species.

Hydrotæa ciliata, F., Curt. 768. *Lispe tentaculata*, Deg., Walk. ii. Pl. xii. 1. *Anthomyia pluvialis*, L., Walk. ii. Pl. xii. 2. *Polietes lardaria*, F., Walk. ii. Pl. xii. 9. *Drymeia hamata*, Fln., Walk. ii. Pl. xii. 12.

(*To be continued.*)

A NEW SPECIES OF DASYDYTES—ORDER GASTROTRICHA.

THIS Order of the mighty worm-alliance seems to have attracted very little, if any, careful observation in this country of late years, although both on the Continent and in the United States a great amount of attention has been devoted thereto. Quite recently, in 1887-8, Mr. A. C. Stokes added greatly to our knowledge of the American forms, describing in his papers in the "Journal de Micrographie," numerous new species of Chætonotus and other genera; while in 1889, Dr. Carl Zelinka published an exhaustive monograph of the group ("Die Gastrotrichen," in "Zeitschr. f. wiss. Zool.," xlix., Part 2), in which all Stokes' recent species are included, and to which admirable work I can confidently refer British microscopists desirous of extending their acquaintance with these creatures.

In our own country, Mr. T. Spencer described, in "Journ. Quekett Micro. Club," January 1890, under the name of *Polyarthra fusiformis*, an animal which, however, is not a rotiferon, but (as pointed out by me in the same Journal, January 1891) clearly referable to the genus Dasydytes of the Gastrotricha. This must evidently be known in future as *Dasydytes fusiformis*, Spencer; it is a pretty and curious little creature, very distinct from any previously described.

In all probability, many or most of the species recorded from the above countries, are also common to Britain, if observers would but search systematically for them, and place on record [such forms as they may chance to meet with. It is for this purpose of awakening interest, and so helping to increase our knowledge of our indigenous Gastrotricha, that this communication is written.

In November, 1890, whilst searching for Rotifera, I came across, in water from a pond near Leytonstone, Essex, some specimens of a Dasydytes which

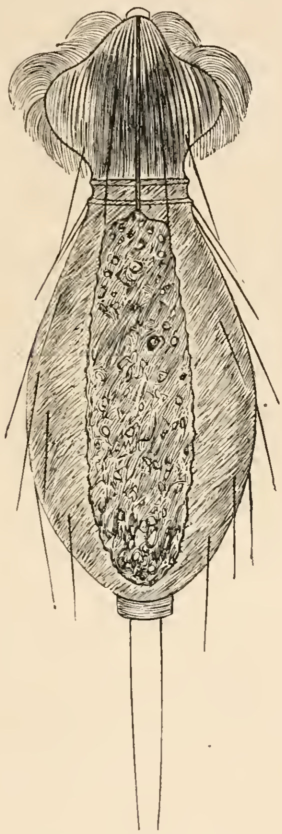

Fig. 143.—*Dasydytes bisetosum.*

does not appear to be identical with any member of this genus included in Dr. Żelinka's recent monograph, above referred to. Some half-dozen individuals were seen in all, and afforded me opportunity of making the following observations, and of securing a fairly accurate sketch of the animal. I propose to call this *Dasydytes bisetosum.*

The body is plump and of oval outline when seen dorsally, rounded posteriorly, and of course without any caudal fork; anteriorly, the trunk narrows to the neck, which latter is very distinctly marked off from the head. A couple of transverse wrinkles in the skin are more or less visible, crossing the neck. The head is large and wide, three-lobed in dorsal aspect, the lateral lobes prominent like puffed cheeks; the width of the head is nearly twice that of the neck, and about three-fourths that of the body at its widest part. Both head and neck are usually considerably flattened, excepting the lateral head-lobes, which are somewhat globose and thicker than the central region of the head. The trunk is not at all flattened, appearing circular in optical cross-section.

The head is covered on all its surfaces, dorsal, lateral, and ventral, with numerous long vibratile cilia, directed backwards.

The body is furnished, on its lateral surfaces, with a few rather short, very thin and delicate, somewhat appressed bristles, apparently arranged in about three longitudinal rows on each side, though this is a point difficult to determine. I do not think any bristles occur on the dorsal surface proper. These setæ occur also on the sides of the neck, and, in side view of

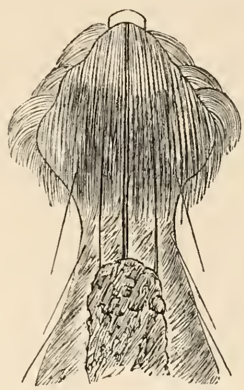

Fig. 144.—*Dasydytes bisetosum.*

the animal, are seen to be directed dorsally and posteriorly; none are nearly so long as the terminal caudal bristles to be described. The animal's ventral surface is longitudinally furred with active cilia, like all the members of the Order. The body is rounded behind, and has a terminal projection, convexly truncate, from which are given off two long, thin and delicate setæ, quite one-third the total length of the animal's body and head, set wide apart at their base, and carried parallel or with their tips in contact. It is on account of these two conspicuous tail-bristles, which serve by their great length to distinguish this new form from its allies, that I have selected the specific title "bisetosum" for the creature.

The mouth is a permanently projecting tube, surrounded by a ring, at the extreme front of the head. It is continued into a long œsophagus, about one-third the total length of the animal, having a narrow but distinct, straight lumen, and very thick walls, on which I could detect no cross-striation.

The gullet terminates, at the point where the neck passes into the trunk, in a long straight stomach, running along the ventral side of the body-cavity, and crowded with colourless food in pellets; this is continued, without any visible constriction, into the intestine, and ends in the anus just in front of the rounded posterior extremity of the trunk. I could not determine the presence of the water-vascular canals and contractile vesicle; almost certainly these exist, but are exceedingly difficult to observe.

Dorsally to the stomach is situated a fairly large, colourless body, exhibiting a central nuclear vesicle; this body was formerly thought to be the ovary, but Dr. Zelinka has shown that the true ovaries in the Gastrotricha are paired organs placed near the venter, one on each side of the intestine, (thus corresponding in position with the paired ovaries of the family Philodinadæ of the Rotifera). The large dorsal body is a developing ovum; whether this is contained within an oviduct having extremely delicate membranous walls, or simply lies freely in the perivisceral cavity, is doubtful; as also is its mode of exit from the body.

The creature swims actively with an even gliding motion through the water; in no case did I observe any jerking or springing, the weak body-spines being probably useless for such a mode of progression.

The head is often freely moved up and down upon the neck, but has not the constant drooping appearance (in side aspect) noticeable in *D. fusiformis*. The lateral lobes seem capable, to some extent at least, of being protruded or retracted at the creature's will; at certain times, the outline of the head appeared quite conical, or very faintly five-lobed (cf. the figures), while at others, the *same* animal presented the distinctly three-lobed outline of the head already described.

The present species approaches in its general outline *D. longisetosum* (Metschn.), but is at once separated from the latter by the relative lengths of the body and caudal bristles. The latter are, in *longisetosum*, shown much less than half the length of the lateral body-setæ (which are described as "very long and stout,") and altogether lack the conspicuousness they attain in *bisetosum*. The present form is also nearly twice the size of Metschnikoff's species, and other differences exist which I think fully justify me in regarding *bisetosum* as specifically distinct.

The entire animal is quite colourless; length, excluding caudal setæ, about $\frac{1}{170}$ inch.

In conclusion, the same pond has furnished me, on other occasions, with specimens of *Dasydytes fusiformis*, Spencer, and *Lepidoderma rhomboides*, Stokes, (the latter only recorded, hitherto, from Trenton, New Jersey), while at Chingford I have met with *Dasydytes goniathrix*, Gosse, and *D. fusiformis*, Spencer. Within the last few weeks, at Oakley, in Bedfordshire, I have taken *Chætonotus Schultzei*, Metschn. These records, insignificant by themselves, serve to indicate the probability of much more extensive results, if microscopic workers direct more systematic attention to the study of this small and obscure group of animals.

PERCY G. THOMPSON.

Bow, E.

SCIENCE-GOSSIP.

WE are pleased to observe that an old and valued correspondent of SCIENCE-GOSSIP, and an ardent naturalist and botanist, Mr. T. D. A. Cockerell, has been appointed Curator to the Museum, Institute of Jamaica, Kingston (which will henceforth be his address). The institute is to be congratulated on having selected such an efficient curator.

THE great engineer, Sir John Hawkshaw, died in his eighty-first year on June 2nd.

PROFESSOR ROBERTS-AUSTEN has discovered the most brilliant-coloured alloy yet known. It is of a rich purple colour, and has bright ruby tints when light is reflected from one surface to another. It consists of 78 per cent. of gold, and the rest aluminium.

THE science of geology has received royal recognition. The Director of the Geological Survey of the United Kingdom has been made a Birthday Knight, and is now Sir A. Geikie.

PROFESSOR LEIDY, the well-known American naturalist, author of the "Rhizopods of North America," is dead.

AT a recent meeting of the Linnæan Society, Mr. Robert Deane exhibited specimens of the rayless daisy, said to grow abundantly near Cardiff. Will some reader there send us a specimen?

WE have received the "Report of the Felsted School Nat. Hist. Society for 1890." It displays a healthy, active, and intelligent love of natural science, and indicates a state of things the author endeavoured to realise in "The Playtime Naturalist."

THE latest Bulletins issued by the U.S. Dept. of Agriculture are Nos. 7 and 8 of "Insect Life," and No. 24 "The Ball-Worm of Cotton," by F. W. Neally.

BISHOP MITCHINSON'S papers in "Nature Notes," on "The Distribution of Rare Plants in Britain," are very suggestive.

WE are pleased to call attention to a highly important *brochure* by the Rev. H. A. Soames, F.L.S. (London: L. Upcott Gill), on "The Scientific Measurement of Children." The author rightly holds that the measurement of children, as they grow, has not yet received the attention it deserves, and he points to the opportunities afforded by schools for settling this physiological matter. Mr. Soames shows how the measurement should be made.

THE Geologists' Association went for an excursion on June 13th to Selborne, under the directorship of Dr. Sclater and Mr. Wm. Whitaker, and on June 20th to Greys Thurrocks, with Mr. F. C. J. Spurrell as guide.

"PANTOBIBLION, or a Review of the World's Scientific Literature," published monthly, is among the latest of periodical announcements.

WE would strongly call the attention of our entomological readers to the papers now appearing in the "Entomologist," by Mr. F. H. Perry Coste, entitled "Contributions to the Chemistry of Insect Colours." They approach this very important subject from a new direction.

THE Rev. Hilderic Friend has an important paper in the last number of the "International Journal of Microscopy and Natural Science," on the "Earthworms of Scotland."

A PIECE of genuine good work has been the result of the "Microscopical Society of Calcutta"—Mr. H. H. Andrew's "Notes on Indian Rotifers." It is accompanied by three exquisitely-drawn plates and twenty figures.

ALL who have the opportunity should pay a visit to Mr. Wm. Bull's Orchid Show in King's Road, Chelsea.

DR. A. MILNES MARSHALL'S lecture on "Animal Pedigrees" is being continued in "The Midland Naturalist."

THE next Annual General Meeting of the British Association will be held at Cardiff, commencing August 10th, under the Presidency of Dr. Wm. Huggins, F.R.S., &c.

THE Anniversary Meeting of the Linnæan Society this year was noteworthy for the address of the president, Professor Stewart, on "The Secondary Sexual Characters of Animals and Plants." The society's gold medal was awarded to Dr. Bornet, of Paris, for researches in botany.

THE Council of the Geologists' Association have decided to publish the long and valuable paper by Messrs. Harris and Burrowes on the Eocene and Oligocene Beds of the Paris Basin as a separate publication, illustrated by maps, sections, etc., at 2*s.* to members, and 3*s.* to non-members.

H.R.H. the Prince of Wales fixed Wednesday, the 17th of June, for the delivery by Lord Rayleigh of the first of the two lectures at the Royal Institution, in connection with the centenary of the birth of Michael Faraday, and Friday evening, the 26th of June, for the second lecture, which was given by Professor Dewar.

IT is with unfeigned regret we have to record the death of an old friend and contributor to SCIENCE-GOSSIP, Professor M. Duncan, F.R.S., &c., in his sixty-seventh year.

ZOOLOGY.

"OUR LANE."—We are sorry that through inadvertence the name of E. H. Robertson, the writer of the charming articles in our columns bearing the above title, was omitted.

THE CHITINOUS PLUG IN MOLLUSCA.—In the December number of SCIENCE-GOSSIP I made reference to the first volume of Balfour's "Comparative Embryology," and gave the reference as on p. 229. I find that Mr. Webb says in the June issue that this page is not the right one. I can only add that it is the page in my copy (2nd ed. 1885), and also in seven other copies which I have taken the trouble (perhaps very needlessly) to examine. This is the only remark I think I have need to make on Mr. Webb's criticisms.—*J. W. Williams.*

HYDROBIA JENKINSI IN ESSEX.—I have received a letter from Mr. W. H. Smith, of Canning Town, enclosing copy of a communication addressed by him to the editor of the "Essex Naturalist," dated 27th March, 1891, which he informs me he has sent to you for publication. Should you insert his letter, I beg you will also publish my reply, dealing with the facts connected with the discovery of *Hydrobia Jenkinsi* in Essex. When Mr. Allen, of Canning Town, sent me, on the 29th of January, 1889, a few hydrobia shells from Beckton for identification, I noticed at once a few with carinated whorls, a form which had never been described as British, and concluded they were either a new species or had been introduced. I took the three specimens up to Mr. Edgar A. Smith (Nat. Hist. Museum) on the 2nd of February, and we then decided to send them to Dr. Boettger, of Frankfort, who replied that they were not known on the Continent, and that the nearest ally was *H. Legrandiana*, of Tasmania. I then wrote to Mr. Allen (16th April, 1889), suggesting that they had been introduced in some raw material, such as flax, hemp, &c., which might have been used in some of the manufactories in the district, and proposed to visit the locality. In his reply (17th April) he offered to accompany me, and wrote: "The discovery is yours, and I am glad of it; I leave the determination in your hands." On the 19th of April Mr. Allen and I went down to the

Beckton Marshes, close by the Barking Jute Factory, and gathered some specimens from the brackish water-ditches. I subsequently made many inquiries with regard to the manufactures in the district, but was unsuccessful in obtaining any helpful information. Later in the year I again visited the locality, and collected a goodly number of specimens, some of which I forwarded to Mr. E. A. Smith. There the matter rested, so far as I was concerned, till I read Mr. E. A. Smith's description of the form as a new species in the "Journal of Conchology" for October, 1889 (published 17th January, 1890). In the same journal further notes appeared, showing that the form had already been taken at Greenwich about two years before (1887), and of which Mr. Allen was aware, having informed me in April 1889, that he had received the information from a correspondent of his in Glasgow. Later on, Mr. Jenkins' Notes on Hydrobia appeared in SCIENCE-GOSSIP for May, 1890, and on the 8th of May Mr. Allen wrote me: "I am sorry to see you are not mentioned as the one who first noticed the shell as non-British." I exhibited a series of the shells, with drawings of the animal, at a meeting of the Essex Field Club (17th May, 1890), which was duly recorded in our "Essex Naturalist," 1890, p. 128, and then associated Mr. Allen's name with the first discovery in Essex. I had certainly hoped to have had the first record in the journal of our club, of which Mr. Allen is a member, but the publication being already a *fait accompli*, I asked Mr. E. A. Smith to write a short notice as a record for the "Essex Naturalist," to which I added some remarks, and gave a drawing of the shell and animal (*vide* "Essex Naturalist," 1890, p. 212). I certainly did not again mention Mr. Allen's name therein, which was scarcely necessary, but would now express my regret for the omission. I am still of opinion, as expressed in the note referred to, that the species may have been introduced. In conclusion, I may say that the species is not, as Mr. W. H. Smith says, a freshwater mollusc; and as to the vague statement that he examined the mollusc months before my visit to Beckton, that may be true, but is certainly misleading, whether intentional or otherwise, inasmuch as that was not till after I had seen it, and called Mr. Allen's attention to the differences.—*Walter Crouch*, *Wanstead*, *Essex*.

HYDROBIA JENKINSI.—Mr. W. H. Smith writes as follows to the "Essex Naturalist":—"Referring to the 'Note on *Hydrobia Jenkinsi*' (in the Oct.–Dec. 1890, issue of the Journal), by Mr. Edgar A. Smith, F.Z.S. It has given me pleasure to note that Mr. Smith has acknowledged receiving his first acquaintance with this new species of hydrobia at the hands of Mr. Walter Crouch, and that the latter gentleman obtained some specimens at Beckton in the early part of 1889. It affords me pleasure to say that the species referred to was discovered at an earlier period than 1889 by a member of your club, who invited Mr. Walter Crouch to visit Beckton. The journey to Beckton resulted in obtaining specimens. It is due to the energy of Mr. W. Allen, of Barking Road, Canning Town, that this species became known to Mr. Crouch and other eminent conchologists. I send you this communication in the hope that you will make its contents generally known to your members, and I ask this favour because I had the pleasure of examining this remarkable fresh-water mollusc months before Mr. Crouch's visit to Beckton, and I can personally vouch for Mr. Allen's anxiety to make his discovery known. I think *Hydrobia Alleni* would be a more commendable name than *Hydrobia Jenkinsi*.—*W. H. Smith*.

NOTHOLCA ACUMINATA.—Referring to Mr. Clarke's note on this rotifer in your issue for June, though given in "Hudson and Gosse" as very rare, it is common in several ponds in the vicinity of Chester. In water from one of these ponds it is not unusual to see six or seven of these rotifers at once in the field of the 2-inch objective.—*A. H. Hignett*.

PRESERVING FISH.—Every naturalist knows the difficulty of preserving fish so as to show their natural form and colours. We are only too well acquainted with the stiff, colourless caricatures of the most graceful and often beautifully tinted of living creatures, seen in museums and elsewhere. Consequently we are pleased to call attention, after having carefully examined various specimens, to the really beautiful examples of prepared fish now being set up by Mr. J. Sinel, of Jersey. In one specimen of the blue-striped wrasse (*Labrus mixtus*), all the striking colours are replaced true to nature; in another (Platessa), part of the colours have been replaced; in the bass (*Labrax lupus*), which usually turns white in drying, all the colours have been retained. Generally speaking, however, Mr. Sinel's system enables all the natural colours to be kept unchangeably. The specimens are also secured against shrinkage, and cannot possibly be injured by damp. Naturalists and anglers can now obtain beautiful specimens of fish for wall and other ornamentation; whilst to museums, Mr. Sinel's examples commend themselves for their beauty, naturalness, and neatness.

BOTANY.

RUBUS LACINIATUS.—Years ago I found a curious cut-leaved bramble growing at Chislehurst; one bush at Prickend, and one on Chislehurst Common, apparently quite wild. I sent specimens to one or two botanists, and was informed that it was merely a form of *R. discolor* (*rusticanus*) by a good authority. In SCIENCE-GOSSIP, 1889, p. 188, I referred to the plant as *R. rusticanus*, form *incisus*. A few days ago I sent a specimen to Kew, and it is now identifi with *R. laciniatus*, Willd., a cultivated species. I have seen *R. laciniatus* growing in Mr. Jenner Weir's garden at Beckenham, where young seedlings were very freely produced; and I presume that the cut-leaved brambles of Chislehurst were simply garden escapes.—*T. D. A. Cockerell.*

Lateral Tubercules.—I find that tubercules may be produced in the axils of leaves by artificial means. This may be done by cutting off a plant of *Ranunculus ficaria*, L., near the root, and placing it in a well-corked bottle; after remaining there for a week or two you will see tubercules of various sizes. They are produced by the reversion of a bud into a root, as is often seen in the potato. This proves that fasciculated roots are but modifications of the stem.—*Henry E. Griset.*

White Heather.—In the June No. of Science Gossip (p. 141), Mr. D. H. S. Stewart, enquirer of the white-flowering variety of *Erica tetralix* has been met with elsewhere than in the Scottish Highlands. I am happy to be able to inform him that I have occasionally met with it in the heathy tracts of this part of the country, possibly half-a-dozen times in fifteen years. Last summer my little boy with me found a whole patch of it, and carried home a handful of the white-flowered stalks. I may say that I have never met with the white-flowering heather, though the ordinary purple-flowered variety covers miles of country about us. By the way, would not Mr. Stewart be more correct, if, following Sir J. D. Hooker ('Student's Flora'), he assigned the ling to the genus Calluna rather than to Erica.—*A. Irving, Wellington.*

GEOLOGY, &c.

The Geology of the Neighbourhood of Winchester.—We have received a new edition of the neat, small, and handy description of the strata and fossils of this district, written for the geological section of the school, by a good geologist, who is evidently too modest to put his name to it. It is a model of compendious, useful, and accurate local information, giving all the thicknesses of the cretaceous zones in the neighbourhood of Winchester, the anticlinals of the Hampshire chalk, a list of pits and sections, with the names of the fossils found in each, and also a tabular list of fossils (Winchester: J. Wells).

NOTES AND QUERIES.

Are Fossils ever found Alive?—At the close of a gossipy geological address some little time ago, I was somewhat startled by an old gentleman who rose to ask, "Are fossils ever found alive, sir?" "Well, no," I replied, "they are not." And I then explained for the second time the nature of a fossil. The old gentleman, however, was irrepressible. "As a boy," he said, "he was present when a live toad was found in a rock 150 feet below the surface," and his story was so circumstantial that I asked him to put it in writing, which he afterwards did, as follows:—"I am a living witness to what I here state, J. Gittus. In hearing a lecture on the subject of fossils, there were several kinds of animals on the screen, and led me to ask the question whether any of them were ever found alive. Because, when I was a boy, I lived with a man who worked in a stone quarry, and I was very often with him, and in getting the stone we had to blow it up with gunpowder, and one time after blowing it up, one of the men picked up a stone that was noticeable, like two stones joined together, and broke it in two, and in it was a live toad which they afterwards destroyed. The question how did that animal get there, and how did he live pent up in that stone?—for the place where we found him was very deep, about 150 feet or more from the top of the rock, and he must have been there a length of time shut up in that stone, now this is a mystery, and cannot be fully comprehended by mortal man. But as I lay in my bed one Sunday night, I was thinking about it; the thought struck me that as there is a great deal of water running through all rocks, that one of the eggs of these animals must have been washed there from some spring or pool, and lodged in some hole of the rock, and come to life, and by the water that flowed through the rock kept alive, but in what way I cannot tell; but he who placed it there could keep it alive as well as he kept Jonah alive in the fish's belly." 'J. Gittus, Bridport Street, No. 5." So runs the old gentleman's story. A well authenticated account of a similar discovery has recently been sent to me by Miss Lydia M. Hawker, of Bredon, near Worcester. Miss Hawker writes: "On the evening of September 27th, 1886, I was sitting alone in the sitting-room at my home in Bredon, Worcestershire, the other members of my family having retired. On the fire was one large piece of coal the size of a man's head; this had been put on four hours previously. I attempted to break it to pieces, but, owing to its hardness, I could only chip off fragments. I then drew aside the ash-pan to make room on the hearth for the rest of the lump, set it down, still intact, and kneeling on the hearth-rug, watched for a couple of minutes to assure myself that all was safe. Suddenly my ear caught a sound of crackling and sputtering in the lump. I turned sharply round to reach my little sponge-lamp, and behold! a small, long-legged, dusky creature, resembling a frog, had leapt into the ash-pan, and was hopping about between its bars. I grasped the situation—and the bars—on the instant, but the bars burnt my fingers, so I jumped up for a kettle-holder. When I returned to the rescue, poor froggy had taken shelter (?) under a projecting shoulder of his former home. I gently touched him; he was dead; stiff, and sadly shrivelled up. He is still in my possession, he keeps well, and is in good spirits—of wine."—*F. T. Spackman, 7, Richmond Road, Worcester.*

Pin in Hen's Egg.—As a reader of Science-Gossip, I wish to bring the following case before your notice, as I consider it most remarkable, and if you think it worthy of your attention, to describe the facts in your interesting paper for the purpose of consideration and enquiry. A friend of mine keeps a quantity of fowls. They are the common kind, usually called, I think 'Barn-door fowls.' On Thursday, April 9th, a number of eggs were collected. A few were given to the gardener. His wife boiled one for his breakfast on April 10th, and when he cracked it a pin was found in the yolk. The yolk and white were in places of a blue-black colour. I should feel obliged if any reader would inform me whether they have ever heard of anything being found before inside an egg, and how it got there.—*F. J. B.*

SNAILS AS A CURE FOR CONSUMPTION.—Your correspondent, Mr. J. W. Williams, may be interested in learning that the snail cure for consumption has been continued in this locality (Truro) in one instance, at least, almost up to the present day. I well remember, some twelve years since, an individual living in an adjoining parish being pointed out to me as a "snail or slug eater," I forget which. He was a delicate-looking man, and said to be suffering from consumption. Last summer I saw this man, and asked him whether the statement that he was a "snail-eater" was true: he answered, "Yes, that he was ordered small white slugs—not snails—when he was young, for 'decline,' and that up till recently he had daily consumed a dozen or more every morning, and he believed they had done him good. There is also another use to which the country people here put snails, and that is as an eye application. I met with an instance a few weeks since, and much good seemed to have followed the use.—*Edmund Rundle, F.R.C.S.I., Royal Cornwall Infirmary, Truro.*

HOW I SAVED MY HIVE OF BEES.—Bee-keepers will long remember the disastrous year of 1888. I have kept bees for thirty years, but have never met with its parallel. Colonies were numerous, and strong enough, but so little honey was gathered, that by May 28th in the following year nearly all were dead, whole apiaries having succumbed, and even where feeding had been attempted few survived. Out of my stock of bees, numbering about twenty-five, three only remained alive, and one was considered to be very weak; under such circumstances one naturally thought more of again increasing one's stock, than of obtaining honey. My neighbours were equally or even more unfortunate than myself, in more than one instance not saving a single hive. I hoped that all three of my hives would swarm naturally, but as is usually the case, the bees would not do as you desired them; two out of the three did not swarm, and I was not disposed to make them do so artificially. The one that did swarm had survived some unusual troubles, having been blown over by the heavy gales on two occasions; the first time on February 4th, when all the hives in the kitchen garden shared the same fate; the second time on March 21st, when it was found topsy-turvey. It was a frame-hive, and swarmed naturally on June 21st. After the swarm had been shaken into the hive, the queen left the bees, and attempted to return home, but on her way I observed her, and caught her, and put her into the hive wherein the swarm had been taken, and all became quiet. This swarm, though rather late, did remarkably well, became very numerous in bees, and gave me a nice lot of super honey, still leaving it very heavy, the bees having had the advantage of ready-made combs. Now I looked on this hive as my best, and great things were expected from it the following season. On April 12th, 1890, I noticed that no loaded bee entered this swarm, although pollen was carried in pretty freely by the bees of the other hives. The hive was heavy and contained plenty of sealed honey: this excited my suspicions about the state of the queen, and made me fear that what I looked on as my best hive would come to grief. On the 21st, having satisfied myself that the hive was queenless, and that it contained a fair quantity of bees and abundance of sealed honey, I gave it a comb containing eggs and brood from another hive, taking away from it a comb of honey, which I gave to the hive from which I had taken the brood. On the 25th I observed the bees carry into the hive a little pollen. On the 28th, I examined the hive, and found two queen-cells, nearly perfect, but not yet sealed over. On the 3rd of May I again examined the hive, and found both queen-cells sealed over. On May 10th, about 3 P.M., as I was standing near the hive, I saw a queen come out of it, and take flight; I waited until she returned, and saw her re-enter the hive; she did not appear to have met with a drone during her outing; I was, however, satisfied that the hive had succeeded in obtaining a queen, and so might recover. On the 12th of May, I again saw a queen return to this hive; and on the 16th I saw the same thing happen, making it appear that there was some difficulty in finding a mate. On the 21st I examined the hive, but could find neither queen nor eggs; still a few bees continued to carry in pollen. On the 26th I left home for three days; and on June 4th I made an examination, and although I did not see the queen, I found brood, some of which was sealed over; so that the presence of a queen was assured. On the 19th of June, I again examined, and saw her majesty. The hive went on very well, and though it gave me no super, it gathered sufficient honey to carry it through the winter without feeding. I think this little bit of experience is sufficient to show how greatly superior frame hives are to the old straw ones: and what a great deal of pleasure and instruction may be had by keeping a hive or two of bees. The hive has weathered safely the past unusually severe and prolonged winter, and is now hard at work. June 1st, 1891.—*C. F. George, Kirton in Lindsey.*

WHITE VARIETIES.—I don't know whether you you care for further notice of the white varieties of harebell and heather. Near Settle in Yorkshire I have several times found the harebell perfectly white, but never more than two or three stalks in one place. The flowers were very much smaller than the common blue one. In a wood, three miles from the same place, I found a patch of white heather about two yards square, some three or four years ago; but to my great disgust two years ago, I found some game-keeper had rooted all up, save about as much as would cover a soup-plate, I suppose because it was interfering with several young trees. I have, however, marked down about twelve other roots in a thirty-acre moorland field.—*W. S. Sykes.*

A SUBSCALARID MONSTROSITY OF HELIX RUFESCENS.—On looking through my note-book I find mention of a subscalariform monstrosity of *Helix rufescens*, which Mr. A. Mayfield sent me from Eaton, Norwich. As I do not believe that I have yet published a description of this shell, I now do so here. Transcribed from my notes, it runs thus:—Large, brownish with white band at periphery; spire elevated with the whorls subcarinated and flattened; body-whorl smaller than in type, depressed, subcarinated; sutures, deep, canaliculate; umbilicus wide, revealing the whorls of the spire; inner lip distinct, and reflected on to the body-whorl so as to form a well-marked "parietal wall"; the whole shell subscalariform. Diam. 11·5 mill.; alt. 8 mill. If this monstrosity has not been named before, it might be called monst *subscalare.*—*J. W. Williams.*

THE conversazione of the Royal Society took place on the 17th ult. Astronomy presented its usual fascinating aspect. Professor Norman Lockyer exhibited first a group of sun-spots, photographed in India as they were passing over the solar surface, and showing a succession of remarkable changes, suggestive of terrestrial cyclones, as they traversed the visible face of the sun. The greatest curiosity was awakened by the professor's photographs of the temples at Karnak and Edfou, in Upper Egypt. There is now a theory that these famous structures were oriented in such fashion that the rays of the sun at 6 A.M. and P.M. on June 21 traversed the whole central aisle of these edifices—in other words, that at least six thousand years ago there was in Egypt a people sufficiently advanced to know astronomically the true length of the year and to determine with precision such data as they needed for their daily sacrifices. The same kind of astronomical motive is supposed to have prevailed with the builders of the huge monoliths of Stonehenge. At the instance of Mr. Norman Lockyer, the Egyptian Government sent out on June 21 observers to Karnak and Edfou to make observations of the shadows which the lines of the temple will make with its principal axis, and as the motion of the sun in the heavens is known, it may be possible to argue backwards from these data to the probable age of the temples. Similar observations were made on Salisbury Plain, with the curious result, perhaps, of learning from the sun's motion in the ecliptic how long ago it is since the stones of that huge place of sacrifice were placed in position by a relatively advanced race of people inhabiting these islands thousands of years ago. Mr. Francis Galton explained in the Council Room his method of personal identification by means of finger prints. It is a curious fact that the small papillary ridges on the bulbs of the fingers, and on the inner surfaces of the hands and feet, persist from youth to age, and are the most unchanging, and apparently the surest means of pronouncing on any human being's identity. With exact anthropometric measurements and descriptions, science is circumventing the criminal classes, and the time will probably come when to the evil-doer Mr. Galton's pictures of the finger tips will be a means of deciding who's who that law-breakers will positively detest and dread. Among the instruments Mr. Wimshurst's improved influence machines deservedly attracted a large amount of attention; but, perhaps, the most interesting of recent electrical achievements is Mr. Crookes's volatilisation of metals. The distinguished chemist and physicist has discovered that he can evaporate gold, silver, and other metals by the electric current. This is accomplished without accumulation of heat, and what looks like the vapour of gold settles as a thin transparent film on a surface of glass. In transmitted light the hue is first ruddy, then, as it becomes denser, greenish and faint yellow, and only finally golden when the film is thick enough to prevent light passing through. A curious and instructive magnetic phenomenon was exhibited by Mr. Shelford Bidwell, in a nickel pendulum which was shown to be magnetic when cold and non-magnetic when heated to about 300° C. Mr. Francis Darwin displayed an instrument called a cup-micrometer for measuring the rate of growth of a plant, while Mr. Walter Gardiner has devised instrumental means to determine the forces concerned in the absorption and flow of water in plants. Mr. Arthur Clayden, M.A., showed by means of the electric lantern some fine meteorological pictures of clouds, taken by the camera in such style as enormously to simplify the study of cloud formation, a department in which a good deal remains to be done. Some fine negatives of hoar-frost were thrown on the screen, the pictures bringing into strong relief the manner in which the ice crystals form on the margins of leaves, the loose fibres of a string, and the thorns of a briar, and the tendency of these crystals to arrange themselves in line with the direction in which the wind is blowing.

ATMOSPHERIC NITROGEN AND ROOT-TUBERCLES.—Two American chemists, Messrs. W. O. Atwater and C. D. Woods, have published in the *American Chemical Journal* the results of a large number of experiments they have been making on the important subject of the acquisition of atmospheric nitrogen by plants. They experimented with peas, oats, and corn, and they conclude that nitrogen is readily absorbed from the atmosphere by these plants, where treated with "soil-infusion," and that the gain of nitrogen is dependent on the number of root-tubercles which the application of "soil-infusion" induces. It should be remembered, however, that these root-tubercles have been found to be literally nests of bacteria, so that the latter may probably produce the nitrogen by assisting in the nitrification of the soil.

ATMOSPHERIC NITROGEN AND LEGUMINOSÆ.—Experiments have been conducted by two French chemists, Messrs. Schloesling and Laurent. It has long been suspected that the natural order of plants Leguminosæ had the power somehow of absorbing atmospheric nitrogen. The leguminose plants experimented upon were grown in closed vessels, which were so arranged that the gases introduced and withdrawn could be accurately measured and analysed. They found that when the leguminose plants were watered with an infusion of nodosities from other plants of the same order, there was an absorption of nitrogen much greater than could be put down to errors of experiment. On the other hand, when the leguminose plants had not been inoculated in this way, and were therefore free from nodosities, no such absorption of nitrogen was observable. It is believed, therefore, these experiments demonstrate that under the influence of microbes leguminose plants can fix and utilise the gaseous nitrogen of the atmosphere.

ERIOPHORUM LATIFOLIUM.—It is stated in Syme's "English Botany" (vol. x., p. 76), that the downy-stalked cotton-grass (*Eriophorum latifolium*) is "rare in the south of England." Being in the neighbourhood of Fair Mile, near Esher, Surrey, on the 18th inst., I noticed what I believe to be a very large bed of it, the mass of cotton-like heads attracting attention and admiration even at a distance. The plants were growing in a morass surrounding a pond, locally called Black Pond. Though familiar with the locality many years ago, I had not visited it for some years and was struck with the appearance. It may be mentioned that the nearest railway station is Oxshott (the name really means Oakwood, but the L. & S. W. R. has now fixed upon it one of the local spellings, suggesting the idea of bovine slaughter at the place), on the new line from Surbiton to Guildford. Although the spot gives the idea of complete sequestration, it is in fact only a few minutes' walk from the high road between Esher and Cobham, near what is called Fair Mile. If I am wrong with regard to the species, I should be glad to be corrected.—*W. T. Lynn.*

COCCUS CATAPHRACTUS.—Will any of your readers be kind enough to inform me where this scale insect is to be found?—*H. A.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing and helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

T. H. C.—The eighth edition of "The London Catalogue of British Plants" is published by George Bell & Sons, price 6*d.*; the "York Catalogue of British Mosses," price 6*d.*, by Ben Johnson & Co., Micklegate, York.

R. C.—Your specimen is the blue flea-bane (*Erigeron acris*).

M. B. Davies.—The insect imbedded in amber is a well-preserved dipterous fly, probably a species of Tachina.

S. Lowe.—You will find a long chapter on fossil sponges (illustrated) in Taylor's "Common British Fossils" (London: Chatto).

R. A. Cooper.—Write to Messrs. W. Wesley & Son, Essex Street, Strand, for their "Scientific Book Circular."

G. A. Hankey.—1. The cuticle of leaves is the delicate transparent skin which covers the epidermis. It rarely shows any signs of structure, only markings produced by contact. It can be detached by slow maceration, and then comes off the surface both of the epidermis and hairs. 2. The mould on palm leaves to which you refer is probably *Graphiola phœnicis* (see Science-Gossip vol. for 1877, page 124).

M. E. Pope.—Your specimen is a variety of the meadow orchis (*O. morio*).

R. C. C.—The specimen enclosed is evidently a very remarkable variety of *Cardamine pratensis*. Send a specimen to the Secretary of the Botanical Record Club.

H. Roberts.—Many thanks for your kind offer. Will you send us a *short* specimen of the sort of thing you mean?

EXCHANGES.

Offered, six different specimens of Scotch granite, one German, and one Sweden, polished on one side and rough on other; also marine shells. Wanted, Newman's "British Butterflies and Moths," or what offers?—W. D. Rae, 9 Claremont Terrace, Alpha Road, Millwall, London, E.

Wanted, Maltwood's finder. Offered, magic-lantern, small telescope, micro-slides or objects, dried plants, &c.—G. H. Bryan, Thornlea, Trumpington Road, Cambridge.

Wanted, Morgan's "Animal Biology," Marshal and Hurst's "Practical Zoology," Prantl's "Botany," Bower's "Practical Botany," Foster's "Embryology," Howe's "Atlas of Biology." Must be cheap, in good condition, and recent editions. What offers to—Shoosmith, Stopsley, Luton, Beds.

Wanted, *Helix arbustorum*, var. *marmorata*. Will give *H. arbustorum*, var. *pallescens*, in exchange.—H. Milnes, Winster, near Derby.

Wanted, Berkeley's "Outlines of Fungology." Will give in exchange Beale's "Microscope." Also wanted, mosses, lichens, and other cryptogams.—C. F. Rea, S.S.M., Blackheath, S.E.

Science-Gossip, six vols., unbound, including 1884 and 1885, with plates; Milner's "Gallery of Geography," twenty-four 1*s.* parts; last two vols. of "American Monthly Microscopical Journal; also "Manual of British Coleoptera," by Stephens, good as new. Wanted, tricycle, or botanical books, Cooke's "Freshwater Algæ," good micro mounts, &c.—J. C. Blackshaw, 179 Penn Road, Wolverhampton.

Offered, Science-Gossip for 1890, Karl Russ's "Speaking Parrots," Greene's "Amateur's Aviary." Wanted, back vols. of Science-Gossip, "Selborne Magazine," scientific works, &c.—H. Roberts, 60 Princess Road, Kilburn, London.

Wanted, "Insects at Home" (Wood), or other work on British insects. Offered, "Insects Abroad" (1883).—Rev. X., 12 The Park, Ealing, W.

Will give 2*s.* 6*d.* for a clean copy of "The Zoologist" for January, 1881.—Chas. Oldham, Ashton-on-Mersey.

Any entomological specimens (of whatever order) would be gratefully received from anyone having duplicates, and having no use for same. Box sent (prepaid) and return postage.—T. R. Hamilton, 11 Crozier Road, Mutley, Plymouth.

Offered, "The Entomologist," vols. 16 to 21 bound, and vols. 22 and 23 unbound; "Builder," vols. 56 and 57 bound, vols. 55, 59, and greater part of 58 unbound. Exchange for foreign land shells, conchological or other scientific books.—G. S. Parry, 18 Hyde Gardens, Eastbourne.

Offered, 325 stamps, all different, many of them rare. Wanted, British land and freshwater shells, foreign marine shells, or offers to—P. R. Shaw, 48 Bidston Road, Oxton, Birkenhead.

Wanted, any land or sea shells from the West Indies. Have a number of natural history and other books to offer in exchange. List sent.—W. Jones, jun., 27 Mayton Street, Holloway, London.

Wanted, a few good fossils from Devonian or old red sandstone. A good equivalent given in exchange in minerals, such as fluor spar, galena, malachite, travertine, radiated calcite, chalcedony, blende, crystals of quartz, selenite, pyrites, calcite and others, or good carboniferous fossils.—P. J. Roberts, 11 Back Ash Street, Bacup.

Wanted, fossils from various localities. A large number of good duplicates offered in exchange.—Thomas W. Reader, 171 Hemingford Road, London, N.

Wanted, specimens of British and foreign echini (sea urchins), or crabs, in exchange for British land, freshwater, or marine shells or fossils.—F. Stanley, M.C.S., Clifton Gardens, Margate.

West African bird-skins in exchange for books (must be latest editions) on natural history.—J. H., 19 Connaught Street, W.

Eleven vols. of Science-Gossip, 1880–90, including the coloured plates, for rare British shells or eggs, foreign shells, or offers.—Thos. H. Hedworth, Dunston, Gateshead.

Helix lamellata, *Pupa ringens*, and numerous other species offered for varieties of British land and freshwater shells. Also wanted, Continental and foreign land and freshwater shells.—Rev. John Hawell, Ingleby Greenhow Vicarage, Northallerton.

For a slide of diatoms, or botanical mount showing placentation, &c., I will send a tube of Chara showing cyclosis.—J. C. Blackshaw, 179 Penn Road, Wolverhampton.

West Indian, South American, and Australian land shells wanted in exchange for European, South African, or North American land, freshwater, and marine. Any foreign correspondence esteemed.—S., 40 Braybrooke Road, Hastings.

Unio pictorum, from a Cheshire locality, offered in exchange for good land and freshwater shells, British or foreign.—R. Cairns, Queen Street, Hurst, Ashton-under-Lyne.

Wanted, land and freshwater shells, in exchange for living *Pupa secale*, and others. Several vols. of Science-Gossip and other books offered for shells.—H. T. Smith, 11 Oakfield Place, Clifton, Bristol.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Popular Lectures and Addresses," by Sir William Thomson, LL.D., F.R.S., &c., vols. i. and iii. (London: Macmillan & Co.).—"Lessons in Elementary Biology," by Professor T. Jeffery Parker (London: Macmillan & Co.).—"The Making of Flowers," by Professor G. Henslow (London: S.P.C.K.).—"The Species of Epilobium occurring North of Mexico," by Professor Trelease.—"Notes on Indian Rotifers," by H. H. Anderson.—"The British Noctuæ and their Varieties," by J. W. Tutt (London: Swan Sonnenschein & Co.).—"British Cage Birds," Parts 13 and 14.—"Glimpses of Nature," by Dr. Andrew Wilson (London: Chatto & Windus).—"The Mediterranean Naturalist," No. 1.—"American Microscopical Journal."—"The Microscope."—"The American Monthly Micro. Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Essex Naturalist."—"The Garner."—"Feuille des Jeunes Naturalistes."—"Journal of Microscopy," &c., &c.

Communications received up to the 10th ult. from: J. E. L.—A. J. H. C.—J. H.—F. B.—C. G.—A. B.—G. H. B. —W. H. S.—A. E. B.—E. B.—W. D. R.—J. H. C.—W. W.—Dr. A. I.—M. D. D.—C. F. G.—J. W. W.—W. J. S.—H. H. A.—J. W. B—D. E. C.—T. D. A. C.—E. R.—H. E. G —J. H. S.—E. D. H.—F. J. B.—W. C.—H. M.—C. F. R.—J. C. B.—H. R.—H. T. M.—C. O.—T. R. H.—E. H. R.—W. E. S.—G. S. P.—P. R. S.—Dr. R. L. R.—J. W. R. S.—F. S.—S. P.—T. W. R.—J. H.—W. J., jun.—P. J. R.—G. A. H.—J. C. B.—E. L. S.—J. C. S.—R. C.—H. T. S.—J. H.—T. H. H.—J. S.—F. B.—A. H. H.—F. B.—H. M.—&c., &c.

WORDS OF BIRDS.

By J. H. GORDON, B.A. Oxon.

I SUPPOSE many people will disbelieve me and think me foolish for trying to fool them, but it is not so. I am as sane and as honest as most men are; and so, when I say I can understand and appreciate the songs and languages of birds, you can take it or leave it just as you will.

Now there must be no mistake, and so I had better say at once that I cannot understand all birds; any more than Professor Max Müller can understand all the languages of men, in this best of possible worlds; no, that would be rather a big job, to say the least of it, though the language of birds when you once understand the method of it, is not nearly so hard as one would expect.

If I had my choice, in fact, I would much rather take up the grammar of a rook, or even a common and vulgar sparrow—and the sparrow is vulgar, too, sometimes when he likes—than wade through the horrible inflexions, conjugations, declensions, and other monstrosities, that hide their sweetness under the names of Latin and Greek, and what not.

Yes, there is much to be said in favour of the speech of the playful warbler. He is in general simple and honest in his likes and dislikes, and in expressing these likes and dislikes. Here and there I do not deny, I have come across a very Gladstone amongst the rooks, who would gather in a crowd and talk to them literally for hours; but he was an exception, and it usually ended in his starting a new—being compelled to start—a new realm of wisdom by his own account.

With the sparrow, too, I have some fault to find; his language is not always so decorous as it should be; indeed, to hear what the sparrow—the London one, especially—says, when he is disturbed at a feast, or the grain spilt from a passing horse's nose-bag, is simply horrible, and would often make me, had I been some what thinner and lighter in bulk, pick up a stone and teach them a lesson.

After all, the sparrow must be forgiven much, for he is a very talented bird; he has a greater proportion of brains to his body than pretty well any other bird, and a great deal more ideas. A very gifted bird is the sparrow, though he does swear terribly and gamble all the sunny days on the house-tops, and jeer wickedly at the homely cat. But great men have great vices as well as great virtues; and so is it in bird-land.

Let us look at another warbler who is very much more greatly admired, and yet whose brains are the minimum possible to the realm of air. The nightingale is the one I refer to; and every one knows how even delicate girls will go out at night-time to hear this songster; and yet with all this glory, he has the smallest vocabulary than any bird I know of. I fancy if the charming maidens who listen shivering and wondering to him as he sings in the neighbouring bush, knew what he meant, they would have him away in disgust.

For this sweet songster, the nightingale, is an awful gourmand; and thinks of nothing but filling himself with worms, grain, anything in fact that comes to hand. When he sets them so simply, and we all believe him to be singing to his mate, he's doing no such thing; it's the early worm he's singing to, it's the early worm he is glorifying with that divine music; and it is because the early worm is later than usual, that he sings at all.

Just give him an early worm and see what he does.

Sing his thanks, you think? No, indeed, if he does sing, it is simply to ask for more, but usually he remains silent.

> "O early worm, O early worm!
> Sweet and toothsome art thou
> With the dew upon thee,
> In the glory of the morn!
> There is nothing sweeter than
> The early worm
> With the dew upon him in the
> Glory of the morn!"

That is his song; and he will go on singing that for hours, until the early worm turns up. He knows no more, poor bird, and what is worse, wants to know nothing more.

He is ignorant: very, very ignorant; and he is happy: very, very happy in his ignorance.

His total vocabulary does not exceed some sixty words; whilst the sparrow, often runs over into thousands, especially when he is in a rage, and at a loss, then he invents a dozen new adjectives on the spur of the moment. Besides the first bird sticks superstitiously to his fifty words, whilst the sparrow is simply avaricious of new ideas and new words.

Let a sparrow invent some taking phrase, and it is immediately taken into the bosom of the language, and in a few weeks in common use by all alike.

I remember a sparrow nicknamed a pea-shooter, but what would be translated "quick-joy," because of the delight of eating the peas, after the rapid flight. Now every sparrow—even the rather stupid hedge-sparrow—speaks of many other things under that name—as "rain-drops."

One of the pleasantest afternoons I ever spent was passed in listening to a trial by rooks.

One of the rooks was accused of playing the decoy-duck with some of his fellows, and of being in league with certain farmers; and of thus causing many of his comrades to adorn the inside of a horrible chamber, called a pigeon-pie.

The defence was, that he could not understand the farmers, nor the farmers him; secondly that he gained nothing by doing this great wickedness, as was evident, if he did do it. But to this was replied that he was allowed a free entrance into a granary stocked with fresh grain; and that was evidence conclusive.

The poor fellow, whom I pitied greatly, tried to show that he had found a hole in and offered to show it the company generally; and this gained him many friends; indeed I thought he was safe. No, his enemies were too fiercely determined; they reminded the folk present of a new-sown field, and demanded an instant verdict.

That decided it, and he was instantly found guilty and pecked to death.

But there are other much more kindly views of bird-life to be gained than the one I have described.

I remember one very affecting incident: a small bird of the wren tribe had been severely hurt and was still very ill when the day for the annual migration came; indeed, amongst all the denizens of the thicket, a general belief was expressed that the poor little wren must be left behind to winter in the land of snow and frost.

His mate nearly lost her head in the agony of the separation, for there were young ones, and one at least had to go to look after them. There he stood divided between love and duty; should he leave his dear companion of the summer, or should he leave his young ones to go forth and die perhaps in a foreign land?

And so he flew from tree to tree in wild terror and despair.

At length there came slowly two great cranes across the wide expanse, and with a mad hope in his heart he advanced and humbly besought their help.

They were kind-hearted creatures; and on his promising to keep a good look-out for frogs, they took the wee wren under their wing, and carried her along with her family into the far away country.

Happy wren and happier cranes!

LAC (*COCCUS LACCA*).

By H. Durrant.

THIS insect, like its congener the cochineal insect, belongs to the order Hemiptera. Its habits and economy are nearly identical with it. When a colony of several males and females select a branch of a tree for their home, they puncture it, and a milky exudation follows, in which they are soon entombed, and which furnishes them with both food and shelter. It forms irregular dark-coloured, resinous masses on the twigs of the trees which it surrounds, and which is gradually added to until they are sometimes nearly an inch in diameter. The trees most usually affected are the *Ficus Indica* and *F. religiosa* which both abound in a milky juice. When the season arrives, the natives collect the encrusted twigs, which in this state are known commercially as "stick-lac." It contains about seven per cent. of resin and one-twentieth part of colouring matter. To separate the sticks, colouring and other foreign matter, the stick-lac is placed in large vats of hot water which melts the resin and thus liberates all impurities. It is then taken out and put into oblong bags of cotton, and a man standing at each end of the bag holds it over a charcoal fire. By this plan the resin is liquefied and drops through and falls on to the smooth stems of the Banyan tree, placed purposely to catch it. This flattens it out into thin plates, and it is then known to us as shell-lac. If the colouring matter has not been well washed out the resin is left of a very dark colour, thus we find in the lac-market, orange, garnet, and liver varieties. That which most nearly approaches to a light brown colour being the best.

When separated from impurities, pulverized, and the major portion of colouring matter removed, it is known as "seed-lac."

Sometimes it is melted up and made into small cakes; in this state it is known as "lump-lac." The water which remains behind after the lac has been softened is rich in a colouring matter akin to that of cochineal, so that when strained and evaporated, a beautiful purple residue is left. Cut into cakes this forms another important article of commerce, viz:—"lac-dye."

Shell-lac is soluble, in anhydrous alcohol, ether, fat, and volatile oils. In the alcoholic solution it forms a fine varnish.

Hydrochloric and acetic acids also dissolve it. It is necessary sometimes to bleach it, for the manufacture of colourless varnishes, sealing-wax, &c. This is effected by dissolving in caustic potash, and passing chlorine gas through the solution. It can then be pulled and twisted into sticks. Seed-lac is much more soluble in alcohol than shell-lac. Lac-dye is soluble in sulphuric and hydrochloric acids. The mordant for use in dyeing is generally bi-tartrate of potass and protochloride of tin.

The chief use of lac is for the manufacture of varnishes and sealing-wax. The differently tinted sealing-waxes are produced by adding vermilion for red, ivory black for black, and verditer for blue (sometimes smalt is used). For a white wax, the lac is simply bleached as before mentioned.

To obtain the fine golden colour sometimes seen, powdered yellow mica is incorporated with it. Shell-lac is imported from Assam, Siam, and an inferior quality from Bengal.

Pegu stick-lac is exceedingly dark, and therefore not fitted for the finer uses of lac; but the finest lac of a very light sherry colour comes from Circar.

We receive something like 1,000,000 lbs. annually, but a large portion of this is again exported to Germany, Italy, and other foreign countries. To each male insect it has been computed there are not less than 5000 females, the males being twice as large as the females.

After the first melting of the lac it is usually more tenacious than after subsequent meltings, which tend to make it hard and brittle. The ancient Chinese were well aware of this property, as is evinced in some of their works of art which remain perfect to this day. They are usually small boxes either in wood or metal, which have had a thin coating of lac, and while soft and plastic, had been moulded into various beautiful forms. Some of these works of art fetch considerable prices.

At the meeting of the Geologists' Association on July 3rd, Professor Blake read a paper on "The Geology of the country between Bridlington and Whitby, the district to be visited during the Long Excursion."

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

By E. Brunetti.

[*Continued from p.* 160.]

(6.) *Acalypterata.*

Over five hundred species of *Acalypterata* are British.

An analytical table even of the groups is impossible here, as Verrall admits twenty-two divisions, which by his terminations would appear to be ranked by him as distinct families.

Some Continental Dipterologists make a still larger number of groups. Walker divided them into ten.

Most of the *Acalypterata* are small flies, generally obscure in colour, though some are brilliantly coloured and easily recognised, the majority, however, being closely allied and difficult to identify.

A great many species have been introduced as British that do not appear to be so.

Mr. Verrall's arrangement of the genera differs from that of Schiner (still probably the best Continental authority), and I shall follow the former in these notes.

Cordylura, Fln., inhabits damp fields and the cooler spots in woods; long-bodied and rather short-winged flies; long 4–6 mm.

Scatophaga, Mg., is a carnivorous genus, the larvæ living in dung, two or three species being very common everywhere, especially *S. Stercoraria*, L., which in the ♂ is clothed in bright yellow hair, the legs also similarly clothed, the antennæ and eyes are black, the wings yellowish grey; long 8–10 mm. In the ♀ (smaller) the colour is entirely grey. The face is reddish in both sexes.

Orygma, Mg., *Cœlopa*, Mg., and *Actora*, Mg., are found on seaweeds. Flies of rather an abnormal appearance; flattened; with small heads and short thick legs, often pubescent.

In *Helomyza*, Fln., the larva feeds on fungi, woods, fields and pastures; several species are British; allied.

Dryomyza, Fln., occurs in woods; larva lives in mushrooms. Large flies; *D. analis*, Fall., has marked wings.

Sciomyza, Fln., frequents short herbage and shady woods. Several species are British, more or less closely allied, rather small in size.

Tetanocera, Fln., is found on aquatic plants, larva aquatic; the flies not being rare; of good size; stoutly-built; usually more or less tawny in colour, and from 5 to 9 mm. long.

Limnia marginata, F., is a brownish-black fly, with yellowish white face; reddish front with two black spots on inner side of eyes; brown wings covered pretty uniformly with small round grey spots, the fore-border and tip being brown; legs brown; common; long 8 mm.

Elgiva, Mg., resembles *Tetanocera*; two or three of the five British species are fairly common.

In *Sepedon*, Latr., the imago has the faculty of running over the surface of water; allied to *Elgiva* and *Tetanocera*; two species British.

Psila rosæ, F., feeds on the carrot in the larval state. Ten species of *Psila* are British, resembling *Tetanocera*.

Loxocera, Mg. (2 spp.), inhabits damp woods, running over the foliage.

Micropeza corrigiolata, L., a fly with much attenuated thorax and abdomen, and long and thin legs; found chiefly on broom; long 6 mm.; common.

Dorycera graminum, F., occurs in grass and

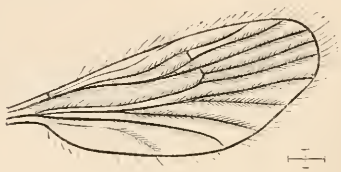

Fig. 145.—*Culex*, L. (mag.)

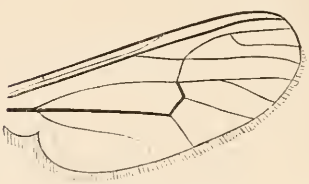

Fig. 146.—*Dixa*, Mg. (mag.)

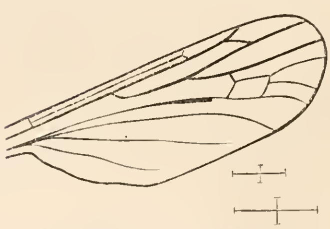

Fig. 147.—*Limnobia*, Mg. (mag.)

flowers, sometimes swarming; larva aquatic; pupa two-horned.

Ceroxys, Mcq., on tree trunks.

Platystoma seminationis, F., on flowers and hedges—in spring; somewhat resembling *Limnia marginata* in general appearance, but smaller and more stoutly-built.

The *Trypetidæ* are a well-marked group, in which the wings are beautifully ornamented with brown and black markings, thus affording an easy means of determining the species. The principal genera are *Trypeta*, Mg., and *Tephritis*, Latr., all the genera occurring on plants, the larvæ being leaf-miners.

Lonchæa, Fln., and *Palloptera*, Fln., inhabit fields and grassy banks.

In *Sapromyza*, Fln., the larvæ live on decaying animal matter. Macquart, a French writer, has found them in fungi; about twenty species are British; many common; mostly closely allied, and nearly all yellowish, with yellowish wings.

S. rorida, Fln., is tawny; face broad, with a small black spot on the vertex; eyes black; wings yellow; legs pale yellow with black tips; common; long 4 mm. *S. lupulina*, F., is distinguished from the latter by a bluish-grey thorax.

Opomyza germinationis, Fln., very common every-

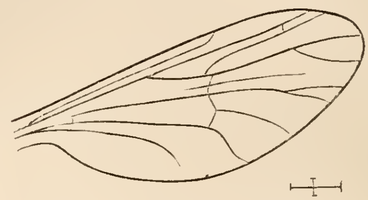

Fig. 148.—*Ptychoptera*, Mg. (mag.)

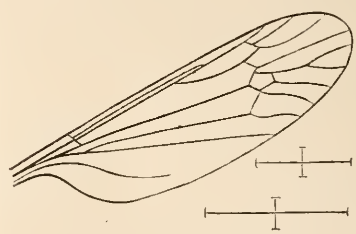

Fig. 149.—*Rhyphus*, Latr. (mag.)

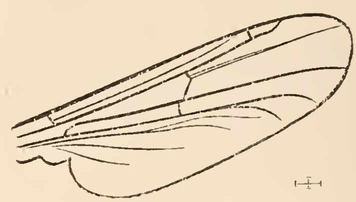

Fig. 150.—*Tanypus*, Mg. (mag.)

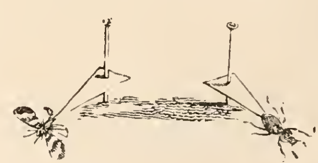

Fig. 151.—Method of pinning down Diptera, &c.

where. Yellowish, with a dorsal row of blackish-brown spots on the abdomen; face, antennæ, and legs yellow; wings pale grey, the two transverse veins and border towards the tip blackish; long 4 mm.

Sepsis is common on umbelliferous flowers.

S. cynipsea, L., smooth; shining black; wings clear, with a small black round spot at tip; long 4 mm.; larva lives in decaying animal matter; very common everywhere.

Piophila casei, L., is the common "cheese-hopper," living in old cheese. The imago is shining black, with the lower part of the face yellow; clear wings; hyaline black legs with the base of the femora and tarsi yellowish; long 3–3½ mm.

The other British species, *P. luteata*, Hal., is closely allied, the larvæ living in old bacon. Kirby and Spence have described its life history.

The *Ephydrinæ* are a group of closely-allied, sombre-coloured small flies, of which the British species have been worked out by Haliday. They are tolerably abundant in Ireland, but also occur all over England in grass, fungi, and ditches; some on aquatic plants, and a fen on the sea coast, and in salt-marshes.

Hydrellia griseola, Fln., probably the commonest species, is blackish grey, with clear wings, reddish eyes and black face, which, when seen from below, shows a wide whitish stripe in the centre; long 3 mm.

Drosophila, Fln., is found on *Cruciferæ*, the larvæ feeding an oak-apples. Their movements are slow; at least one species (*D. funebris*, F.) occurs in houses, collecting round beer and wine casks. Reaumur described the larva of one species.

Meromyza, Mg., is a genus of limited extent, of small black and yellow flies, inhabiting herbage. Two species are common; the peculiar venation affords an easy means of recognition.

Chlorops, Mg., is an extensive genus, of which Verrall gives eight species as indigenous, though probably several more will be found in Britain, most of them common, living in the larval state on wheat and barley, one species thus destroying the sexual organs of the barley.

Sometimes they occur in swarms. The species are closely allied; generally yellow in colour, marked with black; but some of them are tolerably easy to recognise. They inhabit sunny fields and banks, chiefly occurring during July and August.

Oscinis, Latr., infests wheat, their habits being similar to those of *Chlorops*.

Agromyza, Fln., supplies us with eleven species, found in fields and woods; small darkly-coloured flies; closely allied.

Phytomyza, Fln., has a venation of its own, and is allied to *Agromyza*. The European species of this genus, as in *Agromyza*, are very numerous. They occur on plants from April till the end of summer. Walker speaks of a species infesting the corn-feverfew.

Borborus, Mg., is a genus of well-built, sombre-coloured flies, several species being common, especially *B. equinus*, Fln., which is a small brown fly, the abdominal segments being sharply marked off; the face yellowish; the legs brown, with lighter tibiæ; the wings nearly clear; very variable, especially in colouration of legs; long 3–4 mm. Haliday has monographed the British species of *Borborus*. The larvæ live in decaying animal and vegetable matter.

In *Limosina*, Mcq., the venation is again peculiar to itself, about twenty species being British. Haliday has monographed them.

Asteia, Mg., is found on haystacks.

Cordylura pubera, L., Wlk. ii. Pl. xiii. 2. *Scatophaga scybalaria*, L., Curt. 405. *Orygma luctuosum*, Mg., Wlk. ii. Pl. xiii. 5. *Dryomyza flaveola*, F., Wlk. ii. Pl. xiv. 1. *Sciomyza albocostata*, Fln., Wlk. ii. Pl. xiii 7. *Tetanocera ferruginea*, Fln., Wlk. ii., Pl. xiv. 2. *Psila fimetaria*, L., Pauz. xx. 22. *Ortalis guttata*, Mg. Curt. 649. *Ulidia demandata*, F. Wlk. ii. Pl. xv. 4. *Tephritis corniculata*, Wlk. ii. Pl. xv. 6. *Sepsis annulipes*, Mg. Curt. 245. *Chlorops tæniopus*, Mg., Curt. Farm. Ins. Pl. H. Fig. 2. *Agromyza denticornis*, Pauz., Wlk. ii. Pl. xviii. 3. *Limosina sylvatica*, Mg. Wlk. ii. Pl. xiv. 9.

30. *Phoridæ*.

Over twenty species of this family are British, the larvæ feeding on animal and vegetable substances. Bouché thinks some species are parasitic on larvæ.

Phora rufipes, Mg., lives on nearly everything, a correspondent of mine once bred it from a beetle (*Rhizostrogus solstitialis*, Latr.), one of the scarabæidæ. It is a blackish-brown fly, with pale yellowish-brown legs and clear wings; long 2 mm.

The venation of this family is easily recognised, being unlike that of any other group.

Phora rufipes, Mg., Wlk. ii. Pl. xix. 6. *P. abdominalis*, Curt. 437.

III. Eproboscidea.

In this group the larvæ and pupæ are developed in the abdomen of the female. In the imago the head is retracted, and the antennæ placed in a cavity in the head. Wings rudimentary or abnormal; parasitic.

31. *Hippoboscidæ*.

All the species of this family are more or less uncommon; the antennæ are stylate, the prothorax distinct.

Hippobosca equina, L., known as the forest-fly, is parasitic on horses and cattle, and occurs in the New Forest and other parts of Britain. It is brown, the dorsum of thorax darker, with a pale yellow triangular spot in the centre; scutellum yellow; wings, abdomen, and legs pale brown; long 7 mm.

Melophagus ovinus, L., is the sheep-tick. The head is distinct from the thorax, the antennæ are in the form of tubercles; no ocelli.

Stenopteryx hirundinis, L., lives on the swallow, and is not unfrequently found in their nests; head placed in a cavity of the thorax; antennæ ciliated; ocelli present.

Ornithomya avicularia is parasitic on birds, usually the plover, partridge, and lark.

Curtis gives good plates of three species:—*H. equina*, L., Curt. 421. *S. hirundinis*, L., Curt. 122. *M. ovinus*, L., Curt. 142.

32. *Braulidæ.*

The one British species of this family, *Braula cæca*, Nitzsch, is a small, horny, shining red-brown apterous fly with black spines and hair; proboscis prominent, horny, yellow; antennæ three-jointed; scutellum and hæteres absent; legs short, all of equal length; tarsi five-jointed; last joint with large broad claws. Parasitic on bees; very rare.

33. *Nycteribidæ.*

In this family the body is crustaceous, the head small, the legs thick, long and bristly, the abdomen being composed of five or six segments in the ♂, and only two in the ♀. The coxæ are remarkably large.

Two species of *Nycteribia* are British, *N. Hermanni*, Leach, and *N. Latreillii*, Leach, the latter being rather smaller than the former; both species are rare, and infest the common bat.

Nycteribia Latreillii, Curt. 277.

In conclusion I should like to reiterate that this paper is only intended as a groundwork on which beginners can build up a more extensive knowledge of this order, and is written more for the purpose of gaining this neglected group additional students than to represent even an approach to a handbook of British Diptera.

The descriptions, though short, are, I trust, concise, and may enable beginners to obtain a fair acquaintance with the general appearance and structural characteristics of the majority of families and sub-families; and I am in hopes that the diagrams of wings, though only roughly delineated, may supply the student with the means of identifying many a genus.

I may add that, whenever my limited hours of leisure permit, it always affords me the greatest pleasure to render any assistance I can—in the way either of naming specimens or supplying further information on any particular group.

E. Brunetti.

129, *Grosvenor Park, Camberwell, S.E.*

NOTES ON NEW BOOKS.

Glimpses of Nature, by Dr. Andrew Wilson (London: Chatto and Windus). Dr. Wilson has long earned his spurs as a trusted and talented populariser of science. A few priggish specialists, who imagine that a knowledge of a few of the muscles of a flea's foot, entitles them to speak authoritatively about the Creator and the creation, sometimes sneer at "popular science." They might as well sneer at popular politics, popular art, or popular theology. The greatest populariser of the latter was Christ himself. Knowledge, to be useful, must be democratic. Hence we have no sympathy with the few prigs who would keep what little they know to their own select circle; and, whenever they have anything to say, say it in the least understandable and most technical phraseology their limited knowledge of language permits. All knowledge belongs to humanity, and the man who undertakes the responsible position of interpreter of science to the people, occupies a most important place. It is given to but few men to be real teachers and genuine popular writers. There have been thousands of schoolmasters, but only one Dr. Arnold; hosts of naturalists, but only one Gilbert White and one Richard Jeffreys. The genuine populariser of science possesses a distinct and rare gift. You can train thousands of specialists to any department of work, if they only possess industry enough; but all the training in the world would not make popular instructors of them, like Charles Kingsley, Richard Proctor, and Andrew Wilson. Therefore we welcome this charmingly got-up book, with whose contents many of our readers have doubtless already made themselves partly acquainted in the pages of the "Illustrated London News," where there may have been suggested to them the desire to see these clever papers collected in an available and consultable form. The numerous illustrations, which accompany the text now for the first time, render the descriptions all the more intelligible.

Our Country's Flowers, by W. J. Gordon (London: Day & Son). A beginner in English botany could not do better than procure this book. It is illustrated by upwards of 500 chromo-lithographs, which, if a trifle over-coloured, can easily be allowed for, and will doubtless tone down. Besides these, the chapter headed "Index to the Genera" has a clear and easily understood woodcut of the generic characters of each kind. The chapter "Index to Species" gives a clear account of each species of wild-flower. There are also chapters on "Local Names," "Classification," "Tabular Scheme," "Natural Orders," "Examples of Identification" (a very useful chapter to a beginner), "Derivation of Generic Names," &c., as well as a copious glossary. As it is bound in limp cloth, it can easily be carried in the pocket. For the purpose of merely identifying common British plants, it is one of the best and cheapest works we have.

Handbook of the London Geological Field Class (London: George Philip & Son). A neat, handy, and much required manual for the happily increasing tribe of amateur London geologists. Five years ago Professor Seeley, F.R.S., started a London field class for geology, and took the members to all the best sections and fossil collecting-grounds round the metropolis. Professor Seeley is a born teacher, and delights in his work. You have only to interrogate any of the students of his field-class to find with what affectionate enthusiasm they regard him. The present volume is in reality the notes made by the students themselves, and is a sample of their note-books and records of observations. It is a capital digest of Professor Seeley's lectures on these occasions. The book is illustrated by capital sections drawn by Mr. Nicol Brown. It is a record of honest work earnestly done, and is therefore both a *vade-mecum* and a stimulant to all those who desire to explore the interesting geology of the London district for themselves.

Outlines of Field Geology, by Professor A. Geikie (London: Macmillan). This is the fourth edition of Professor (now Sir Alexander) Geikie's well-known and popular little book. We have no hesitation in saying it is the best of its kind ever issued. No other authority is so capable of teaching field-work, considering his position as the Chief of the Geological Survey, and none other is more ready to teach. The present fourth edition has been thoroughly revised and considerably enlarged, and there is much in it which is new, especially that part giving an account of the schistose rocks. New illustrations have also been added where necessary.

Among the Butterflies, by B. G. Johns (London: Isbister & Co.). We are pleased to see Mr. Johns so capably following his father's footsteps as a good naturalist. The present little volume is handsomely got up, and the twelve plates, which contain sixty-seven figures of our English butterflies, are excellent specimens of natural history wood-cutting. Mr. Johns is possessed of much literary ability, and tells his story pleasantly and gracefully. This ought to be a very popular little book.

The Human Epic. Cantos I.–V., by J. F. Rowbotham (London: Kegan Paul & Co.). The author of this suggestive poem is an old contributor to SCIENCE-GOSSIP. He has already won his spurs as an acknowledged poet; and this, his latest book, affords fresh evidence of the natural insight which all genuine poetry possesses. Tyndall somewhere says that the rhythmical movements of the molecules of a drop of water, and their relations to the mysterious and unknown forces governing them, if even baldly told, transcend in dramatic interest a book in "Paradise Lost." Mr. Rowbotham is one of the first of the younger school of poets to see the vast advantages which science holds out of subjects for poetic treatment. Tennyson made the discovery half a century ago. Mr. Rowbotham heads the five cantos of his "Human Epic" as follows: "The Earth's Beginning," "The Origin of Life," "The Silurian Sea," "The Old Red Sandstone," "The Age of Trees." Geology is full of natural poetry, and the author is a good geologist, as well as "Scholar of Balliol College, Oxford." We cordially commend Mr. Rowbotham's charming cantos to all nature-lovers.

ROSSENDALE RHIZOPODS.

No. 4.

THE genus Centropyxis is also a very common form here, and from the writings of others, appears to be widely distributed. I find it in almost all my collecting-places, the various wells, ponds, and ditches furnishing well-marked varieties. It is closely related to Difflugia; and indeed it is frequently impossible to determine to which of the two a particular specimen may belong. The shell is of various shades of brown, and is composed of chitinoid membrane, incorporated or covered with a variable proportion of quartz-sand or diatoms; the latter, however, I do not find so frequent a constituent of these shells as in the genus Difflugia. The greater number of those having a diatomaceous covering, I procure from several shaded wells where those algæ are plentiful. From Sphagnum, most of the forms of this genus have had the chitinoid membrane, either straw-coloured or a pale, smoky brown, sometimes with a few scattered sand-grains, more frequently entirely without. In my experience the shells of this variety are very shallow. The brown membranous base connects this genus with Arcilla. In the ordinary form, the test appears on the dorsal, on ventral aspects, sub-circular or ovoid; but on a side view, which is not quite so frequently presented, it will be seen to be deepest behind the mouth; in other words, the mouth and top of the shell are eccentric in opposite directions. In this particular it resembles *Difflugia constructa*, so much so indeed, as to be with difficulty distinguished from it. The chief points of differences between the two are that Centropyxis is more decidedly brown, is not so high from the mouth to the fundus, and the margin of the inverted mouth is prolonged into two or more appendages. The drawings will help to make clear the form and general appearance. It will be seen that on a side aspect it is somewhat cap-shaped, being highest behind the oval opening. The most common form has a variable number of spines, more or less divergent, from two to nine, placed laterally and dorsally. These are of the brown basal membrane only. The mouth is large, sub-circular, deeply inverted, and according to Professor Leidy, the margin is produced in one or more appendages. This is generally, from the opaqueness of the shell, impossible to make out, and I have myself never been able to demonstrate the peculiarity, though I have had hundreds under observation at various times. In no case can it be seen, except in the lateral aspect of the shell, and only then in specimens of clear chitine, free from sand-grain. Size from $\frac{1}{100}$ to $\frac{1}{200}$ of an inch.

Fig. 152. A very common form here, of linear and navicular diatoms; with spines.

Fig. 153. Side view of large specimen, whose test is composed of large and small sand-grains.

Fig. 154. Same test, ventral aspect.

Figs. 155 and 156. Front and side aspects of a dark brown variety, test, sand and dirt.

Fig. 157. Test of smoky yellow chitine, incrusted, posteriorly with flocculent dirt, but no sand-grains or diatoms. From Sphagnum.

The genus Arcella disputes with the previous form the honour of being the commonest of the testaceous Rhizopods. They are generally found in association, and there are few microscopists who are not familiar

Fig. 152.—*Centropyxis aculeata.*

Fig. 153.—*Centropyxis aculeata.* (Side view.)

Fig. 154.—*Centropyxis aculeata.* (Ventral aspect.)

with their brown tests. Arcella is sometimes very numerous, not only in the light sediments of our ponds, but also among the Algæ clothing the sides. It was discovered by the illustrious Danish naturalist Ehrenberg about sixty years ago. There are many varieties, some very striking ones, but the forms gradually merge into each other, so that many authorities consider them as one species. Leidy gives five specific names to the more widely separated forms, two of which, *A. communis* and *A. discoides*, are found in all the waters of this district. The shell is composed of chitine, light or dark brown in colour, though occasionally I have found colourless specimens. This membranous test has a minutely hexagonal, cancellated structure, something like the marine diatom Coccinodiscus, though this is not always demonstrable. Many of the varieties have really elegant shells, the dome of some having angular facets, or pits, which being thinner and lighter in colour than the connecting parts, have a charming effect. In *A. dentata* there are a variable number of recurved spines, arranged round the circumference of the shell, and I figure a form in the ventral aspect, somewhat approaching this, though not sufficiently so to justify its being placed in that species.

In *A. vulgaris* or *communis*, as it is indiscrimately

Fig. 155.—*Centropyxis aculeata.*

Fig. 156.—*Centropyxis aculeata.*

Fig. 157.—From Sphagnum, above Balladen. Test of smoky yellow Chitine incrusted with dirt, but no sand-grains or diatoms.

called, the test as generally seen is a brown circular disc, with a central round opening for the emission of the pseudopods. On a side view, the outline is a low campanulate, with the basal border rounded, and the mouth inverted. The height is about half the breadth.

The sarcode is colourless and the mass rests on the base and around the inverted funnel of the mouth, and is connected with the fundus, or top of the shell, by threads of the ectosarc. There are two nuclei, one on each side, and several cont. vesicles. These details can only be made out in transparent specimens. Size variable; average about $\frac{1}{200}$ or $\frac{1}{300}$ of an inch in diameter. *A. discoides*, which is, I think, the prevailing form here, is in my opinion a mere variety, and not worthy of a specific designation. The only difference between it and the preceding is that the fundus is lower, the height of the shell being only about one quarter of its breadth. Irregular, or deformed forms are not of uncommon occurrence.

J. E. LORD.

Rawtenstall.

A DAY AMONG THE WILDFOWL.

WE started early this morning from the old and well-known village of Bosham on our weekly outing among the birds, and anticipation ran high, for our two old boatmen, Kit and Bill, told us that never since the "Rooshen War" had so many wildfowl been seen inside and out the harbour. A fresh wind blows from the north-west, and as the tide is just at low ebb, we can scud down the channel between the mudlands, and so in a great measure escape the ice, which is now here in all but Icelandic severity. A hasty look round to see if all is ready for action and nothing forgotten, and then up sail and off. Day has just commenced, and the birds are astir and by this time fully aware that all men here have guns, and all boats under weigh have men. Close to hand sits solemn and still the heron, apparently fast asleep; for once he is allowed to stay, but had he been old, and in good plumage, his time would have been short. As the light varies other forms come into view. Carrion crows, gulls of all kinds and sizes, and all eager for the smallest of things in the way of an early breakfast. Curlews by dozens, starting up with their weird whistling; whaups, or trants, as they are called, very like the curlew, only smaller; turnstones, dotterel, dunlin, in thousands—so many in fact that one gunner shot twenty-seven dozen and five at one shot—and last, but not least, the homely ever-present rook, driven from the fields and pastures to the muds and flats to pick up a strange living by the tide. On scuds the boat, her crew all alert for sport, and as strange birds do not visit here every winter, each is anxious to find at least one prize as a memento of this severe time. "Burds ahead," quickly says Kit, and with that from the bows he produces a long and well-worn old fowling-piece, which he said had done great work in his father's time. Not a movement on board, and as the boat comes up to them away they go, all over the place, giving us just the slightest chance to score, and out falls a mallard with a dull thud—dead. This is the commencement of a glorious day, and now that the guns have started the game, strings of birds are seen passing right and left, some going up and some down, all in a hurry, and all out of shot. Our mallard retrieved, on we go, for our destination is some five miles lower down, to the mouth of Chichester Harbour, and as long before daylight we have heard guns there, we know good sport is going on, and want to be in the thick of it. Not very far down we fall in with three divers, which prove to be golden-eye ducks, and as we run down on them they rise against the wind all together, and the long gun brings them down in a pretty little heap, fortunately too lifeless to try to get away. Still on we go, and the farther we go the more the excitement grows, for there are birds everywhere in sight, and if this is so inside the harbour, what must it be outside? Soon we get near the old coastguard ship, and a short council of war is held to decide where to go. First we all land, and cross the shingle bank that divides the harbour waters from the outside sea, and what a sight meets our view! As far as the eye can reach are wildfowl, large and small, on the water; surely the whole Arctic supply is before us, so vast is the number. There are acres of brent geese—thousands and thousands of them. Here and there grey-hags, bean and white-fronted geese show up, and amongst them two fine specimens of the snow-goose. Ducks and widgeons in hundreds, a few teal, scamp and pochard, tufted duck, here and there a Black Sea duck (Scoter). Diving birds there are of many kinds popping up here and there, grebes of one or two sorts in sight at once, with razor-bills and guillemots, and coming along from Selsey Bill is a long string of wild swans. We wait to see no more, but rush to the boat and quickly get one gun on Hayling Beach, another on the Point of Wittering Beach, and the boat itself right in the fairway of the harbour's mouth, to intercept this party, should they come inside. But 'tis no good, they just sail majestically along over Hayling Island, then turn up the left wing, and round into the Emsworth Channel, and are safe for a time. Our time is fully occupied in shooting with more or less success at the different parties coming or going, and fine sport it proves. Now a duck, now a widgeon, and now a goose comes tumbling down, first from one gun and then another, and still the hungry ones come on, for the food in the harbour flats. While we have been at our sport, other people have been busy, at one time no less than thirteen punt-gunners are in sight at once, and every now and again the roar of a great gun adds to the general commotion.

The day now wears on apace, and as the shooting is for a time slack a stroll round to see what the other gunners have got is the order of the day. From one we get a pair of shieldrakes, another has some broad-billed scaup-ducks, another a red-breasted merganser, another a splendid goosander, a fine old male bird, and can tell of a puntsman who has shot the hen, which we were afterwards fortunate enough to procure, together with a very beautiful male smew. Collecting all our purchases, we reach the boat, and carefully packing up our specimens, we decide, as the afternoon is far advanced, and the journey a long beat home, to up and away, especially as the swans are still in the harbour somewhere, and we may perhaps fall in with them.

We start then and skirt the Pilsea Sands, in the hope of picking up a crippled bird or two, and are not disappointed, for we bag two more single geese ere we reach Thorney Island, and at last get a sight of some seven or eight swans feeding right in under a bank. Oh for five minutes just the other side of that bank; but as this cannot be we sail steadily on, as far away from them as we can, to pass them and then cross over and sail down on them, as fast as we can go. We manage all this, but they jump at 200 yards and sail away, and partly round us, and to our joy go up and on our way to home. Another mile or two, and we sight them again, and thinking of nothing better, we do as we did at first, and this time, amid a lot of quiet excitement, get within 100 yards before they again take wing. Once more they go up stream; but this time not so far, and soon we are drawing on them. Will they wait? No. Something puts them up, some one way, some another, and now the unexpected happens; they try to join, and to do this five of them come within sixty yards of the boat. Bang! bang! from the 8-bore, and down falls the largest of the lot, a fine old male hooper; another sails away lower and lower in the direction of Dell Quay, and finally disappears, hard hit and never to rise again. This was verified by the bird being caught next morning in a meadow. One swan proved to be just under 20 lbs., and crowned the happiness of all, for the right birds came at last, and made a good finish to as pleasant a day as any gunner ever had.

On reaching home we found a beautiful bittern had been shot close by, and a fine pair of oyster-catchers. These last we got from the owner, and they now form part of that happy Saturday's spoils.

"SEA FOWLER."

THE AVIFAUNA OF UPPER NITHSDALE.

AFTER a long residence in one of the beautiful glens which converge at Thornhill on the Nith, Dumfriesshire, I have taken the following notes of the birds of the district.

During the last thirty years there has been a serious diminution of the birds of prey. The peregrine falcon and merlin are rare, the kite is almost extinct, while the sparrow-hawk and buzzard are becoming very scarce. The kestrel, however, is common, and may frequently be observed gliding over the cliffs near the sources of our upland streams, or pouncing on barn-door sparrows. Owls are very plentiful. The woods around the ducal residence of Drumlanrig, and the large quantity of natural wood which adorns the hillsides along the banks of the tributary streams offers them protection. The tawny owl is the most common. It delights to utter its screech perched on a coniferous tree, and it is the boldest of its kind. The barn-owl is common. The long-eared owl is both rarer and shyer. On one occasion the nest of a barn-owl was found in a rabbit-burrow.

The missel-thrush and blackbird are very common, although, one summer about nine years ago, we missed their delightful songs entirely. They seemed to have succumbed to the previous severe winter. The song-thrush is rare. The fieldfare comes to us in immense flocks in October, and in a few days strips every mountain-ash of its glittering red berries which make these trees so conspicuous after their leaves are shed. The dipper is found in all our streams. The ring-ousel is not uncommon. Everywhere in early spring the simple song of the hedge-sparrow greets us. The redbreast and chaffinch are plentiful. The redstart and night-jar are rare. The whin-chat is heard as it hops along our fences built of uncemented whin-stones. The grasshopper-warbler, and the sedge-warbler are rarely heard, but the wheat-ear is common. Its nest is far from being easy to find, on account of these same stone-dykes.

The wood-warbler and the willow-warbler have increased of late years. The golden-crested wren is plentiful in our fir-woods. Its nest, lined with feathers, is sometimes blown down from the pendent bough. The wren and the willow-wren are common. The lesser white-throat and chiff-chaff are rare. The tree-creeper is more common than appears, for its nest is most difficult to find.

The great-tit is rare, the blue-tit and the cole-tit common. The long-tailed tit, to which Mr. Wallace has given a new significance by pointing out that it is a form specialised in the British Isles since their division from the Continent, is rather scarce. It makes its wonderfully artistic nest in almost inaccessible black-thorn scrub. The pied wagtail is much more common than the grey wagtail. The golden plover and spotted fly-catcher are rare, but the nest of the former is difficult to find. The garden-warbler is not uncommon. The tree and meadow pipit are abundant, so are the skylark and yellow-hammer. We are far from being rich in finches, putting aside the chaffinch. The common linnet is seldom seen except in flocks in winter. The same may be remarked of the lesser redpoll.

The house-sparrow, rook, and starling, are ubiquitous. The cuckoo is plentiful and arrives about the last days of April. Although it delights to lay in a smaller bird's nest, such as the meadow-pipit, I have got its egg in the nest of a kestrel. The carrion crow and jackdaw are not uncommon. The kingfisher is exceedingly rare. As it commands a price, it was entirely exterminated by a band of bird-catchers, more than a dozen years ago, all along that finest tributary of the Upper Nith, the romantic and wood-fringed Skarr.

The swallow, house-martin, and sand-martin are common—but the swift does not come. The ring-dove is abundant, but I have never observed the reed-bunting.

The following birds are very common: pheasant, which has a stupid fashion of nesting on the road-sides, exposed to school-children; black-grouse, partridge, lapwing, curlew, which arrive in March; snipe, land-rail, which comes in the first days of May; moor-hen. The following are not uncommon; red grouse, heron, woodcock, wild duck. The black-headed gull is very plentiful, but the common gull less so. The teal and the little grebe or dabchick, I have not observed.

On the upper courses of our mountain streams the sandpiper may be seen wading. Snow-buntings are among our winter visitors. About farmyards an occasional pair of bramblings may be noticed. In fields where *Prunella vulgaris* grows, may be seen in certain seasons, flocks of twites. Our famous naturalist, Dr. Grierson, lately deceased, put into his museum about twenty years ago a golden oriole shot near Thornhill.

Enough has been written to show, that although Thornhill and the three adjacent glens which converge near it are about twenty miles inland, there is an interesting and well-stocked ornithological district to deal with—the chief paucity being in the numbers of wading and swimming birds and those more numerous where cereals are more abundant.

J. SHAW.

NOTES ON DOG'S MERCURY (*MERCURIALIS PERENNIS*).

LOOKING at the small green flowers of Mercurialis and its general want of attractiveness, it is natural at once to class it with wind-fertilized plants, but on closer examination it would seem rather to be on the debatable land between anemophilous and entomophilous plants, nor is it clear that we are right in assigning it strictly to either. This has been such a late spring, especially in the north, that vegetation is unusually behind-hand, and it was only on the last day of March that the first specimens of the pistillate flowers of Mercurialis put in an appearance. The long spikes of staminate flowers were fairly plentiful previous to that date, but the buds had not opened. The leaves of this modest little plant are not unlike those of the elder, some unbotanical folks indeed call it "ground elder." We welcome its coming less for its own sake, perhaps, than as being the forerunner of the primrose and oxalis and all the earlier spring flowers. It comes up, too, in a business-like manner that is somewhat amusing, for though one of the earliest flowers of the year, the dog's mercury pushes its way out of the ground all ready equipped for the battle of life, as if there were no time to lose, and eager either to scatter its pollen upon the spring breezes, or to display its humble attractions before the insects should be drawn away hither and thither by the bright colours and sweet scents of more favoured competitors for their services. Underneath the loose soil of the dry banks where it flourishes, the little dog's mercury developes both flowers and leaves in a wonderful state of forwardness, so much so that it cannot bring them up in the ordinary way, or the delicate blossoms would be injured, so the plant as it emerges from the ground is bent almost double, leaves and flowers looking downwards, while the strong arch of the stem lifts its nurslings out of their dark prison-house and then gradually straightens, until at last it stands erect, bearing upon its upper portion both leaves and flower-spikes that only need a little sunshine and a little warm rain to bring them to perfection. By the way, is light always necessary for the production of chlorophyll? Mercurialis is very green when it first pushes out of the soil, and there are certainly embryos, like the sycamore, in which the cotyledons are green before they have burst the husk. But to proceed more methodically with our plant. The first question to arise is that of family or tribe, and without the aid of books one might not at once give the dog's mercury its true place with the Euphorbiaceæ, nor guess from outward appearances that it was so nearly allied to the brilliant Poinsettia on the one hand, or the evergreen box-tree on the other, though its affinities with the stinging-nettle may be more apparent. Mercurialis then belongs to the Spurge family, though it contains none of their acrid milky juices, and is even sometimes eaten as a vegetable. The rootstock is slender and creeping, and therefore it enables the plant to spread widely; indeed these creeping roots give our mercury an opportunity for climbing where one would scarcely expect to find it. The lower part of a Westmorland hedge is often protected by an outside fence made of large square slabs of the slaty rock of the country placed close together with their bases buried in the soil. The chinks are sometimes filled up with the loose earth of the bank, and the dog's mercury loves to take possession of them by means of its creeping rootstock, mounting continually higher and higher, and bordering the slates with greenness. The stem is solitary and erect, about six to eighteen inches high, frequently bent at the bottom, and the leaves are crowded towards the summit; the whole plant is more or less hairy. The leaves are opposite, very shortly stalked, ovate-lanceolate with crenate edges. In the bud each half of the leaf is rolled up towards the midrib and it is long before the lower part fully uncurls; the stipules are very small. The stem is sometimes described as four-angled, but this is scarcely correct ; there are, however, two distinct ridges on opposite sides of the stem that change places between each pair of leaves, just like the rows of hairs in *Veronica chamædrys.* These ridges do not appear to be the vascular bundles for the leaves above, because it may be seen on reference to the drawing that they do not enter the leafstalks but stop just between the stipules on the opposite side of the stem, the next pair starting out of the axils of the leaves above to stop between the next stipules, and so on. The flowers of Mercurialis are diœcious and small. The tall axillary spikes of the staminate flowers are certainly conspicuous, but the pistillate are far less numerous and hide themselves amongst the leaves so that they are not very easily seen. The staminate flower is a very simple little thing, being content with one floral envelope composed of three sepals, that in the bud just fit together at their edges, and form a sort of three-cornered box that holds some ten or a dozen stamens springing from a central disk. The filaments are long, slender, and erect, the anthers are pendulous from a sub-globose connective, and the dehiscence is extrorse. In a unisexual flower such as this the pollen should be examined in order to decide whether it be of the light smooth kind adapted specially for wind-carriage, or whether it have any of those roughnesses that characterize the pollen of entomophilous flowers and that facilitate its removal by insects from one flower to another. The pollen of Mercurialis is perfectly smooth and most easily scattered, but then the pollen of the Liliaceæ is also smooth and oval. The lily-tribe is now greatly visited by insects, but Hermann Müller considers that the colour of the perianth must have been originally greenish and unattractive, as the dog's mercury is now. The long filaments are of

Fig. 158.—Very young Male Plant of Mercury.

Fig. 159.—Early Leaf of ditto.

Fig. 161.—Staminate plant (Nat. size).

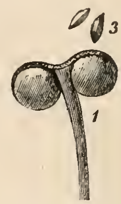

Fig. 163.—Stamen and Pollen (greatly mag.).

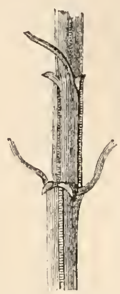

Fig. 160.—Stem of Mercurialis.

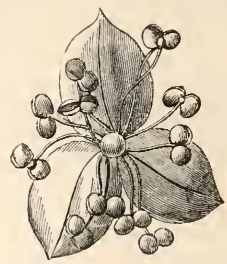

Fig. 162.—Flower greatly enlarged.

Fig. 164.—Stamen.

Fig. 165.—Early State of Stigmas.

Fig. 166.—Pistillate Flower (Nat. size).

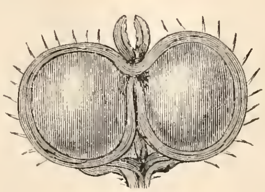

Fig. 167.—Ovary.

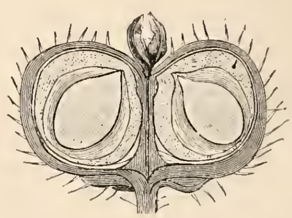

Fig. 168.—Section of Ovary.

course characteristic of wind-fertilized flowers and so far everything seems to favour the anemophilous theory; but how is it with the pistillate flower? The fertile plants are easily distinguished from the male by the absence of the long green spikes, and might easily be passed over as flowerless, especially in the earlier stages, when the flowers are almost concealed amongst the upper leaves, except perhaps one or two that contrive to push out their heads, as if waiting for any chance pollen that the wind might bring to them. If one of the tiny inflorescences be picked it will be found to be growing in the axil of a leaf whose lower portion is very closely rolled inwards, the tip only being fully expanded. Might not these be favourable

Fig. 169.—3. Drop of Honey. 1. Pistillate Flower (Mag.)

to the access of wind-borne pollen to the flowers? There are as a rule two flowers to each raceme, and it s curious that the only bract belongs to the lower flower, it being invariably absent from the upper one in plants that have come under the writer's observation. The upper flower is the first to open; it has three sepals, one of which is removed in the drawing that the essential organs may be more clearly seen; but when the perianth first opens, the flower is in the condition shown in the above figure (2), very quickly the large stigmas expand and spread out their sticky crinkled surfaces to receive the pollen, and it will be seen that the fertile flower of Mercurialis consists principally of the pistil with its enormously developed stigmas. The ovary is two-celled and even in a very young state it is not difficult to remove the outer portion and find that one solitary ovule fills each cell, that it is suspended from the placenta, and if cut through lengthwise the pear-shaped embryo may also be discerned lying with its broad cotyledons in the albumen, the radicle pointing obliquely upwards. To return again to our flower. The two stamens have not yet been examined; they may be seen on each side of the ovary seated on two elongated glands that alternate with the carpels and form the disk. The filaments have no anthers, for the little knob at the top of the nearest must not be mistaken for one. It is intended to represent the drop of honey that is frequently if not always to be seen exuding from the tip. That it is really honey one may easily prove by tasting it, though at first sight it might be taken for a simple drop of moisture. That honey should be secreted by these two otherwise useless stamens is interesting both as an example of the way in which organs may be made to subserve other purposes than those for which they were originally intended, and also because honey is always secreted for the special purpose of attracting insects. See how this improvised nectary lifts its tempting sweets above the recurved pistil, as though well aware that such an insignificant little green flower would never be suspected of containing any thing so delicious and must needs hold out its cup of nectar to passers-by and demand their attention! The staminate flowers of course secrete no honey, but their abundant pollen is sufficient to ensure insect visitors. What must we say then of Mercurialis? The long pendulous stamens, the light abundant pollen, and the large stigmas, all point to the conclusion that the plant is adapted exclusively for wind fertilization, while the drops of honey on the two abortive stamens seem to bid us not be too sure that this is correct. The fertile flowers of Mercurialis open in succession, and as the staminate flowers do likewise there is always some pollen to be carried to them by one agency or the other; indeed it is remarkable how few staminate flowers are open at one time, as if the plants must needs husband their resources and not expend them all at once with too lavish prodigality. Mercurialis is said to have been named by the Romans in honour of their god Mercury, following the example of the Greeks, who called it the "plant of Hermes," but whether because he was the discoverer of the plant or of its supposed poisonous properties is not clear. Our popular name of dog's mercury is supposed to announce its inferior worth, as in the case of the dog violet and dog rose. The plant assumes in drying a curious blue tinge, which is said to indicate the presence of indigo, and a German botanist has detected two colouring substances in the root, one blue, the other carmine.

M. D. D.

Hawkshead, Ambleside.

THE KERMES (*COCCUS ILICIS*).

FROM the earliest ages this insect has been employed to impart a scarlet colour to cloth. It was known to the Phœnicians under the name of Tola, and to the Arabians and Persians as Kermes or Alkermes (Al signifying *the*, as in the Arabian words Alchemy, Alkali).

Dioscorides calls it *kokkos*, and Pliny *coccum* and *granum*. In the Middle Ages it received the epithet Vermiculatum, or "little worm," from its having been supposed that the insect was produced from a worm. From these denominations have come the Latin *coccineus*, the French *cramoisi* and *vermeil*, and our own words crimson and vermilion. The *Coccus ilicis*, or kermes, is found in great numbers in India and Persia, attaching itself to the leaves of a small oak, the kermes oak (*Quercus coccifera*), a low bushy shrub with evergreen spinous leaves, resembling holly. The kermes is also found in the southern countries of Europe, and in the south of France. In parts of Spain, the kermes oak grows in great profusion, as on the sides of the Sierra Morena. Many of the inhabitants of Murcia gain a livelihood by collecting kermes. This work is for the most part done by women, who scrape the insects from the tree with their nails, which they allow to grow long on purpose.

The insect attaches itself to the young shoots of the shrub; the female affixing itself and remaining immovable, till after having reached its full size, about that of a pea, which it much resembles, it deposits its eggs and dies. It is gathered before the eggs are hatched, thrown into vinegar, and then dried in the sun or in an oven. It has been, from time immemorial, used to dye cloth, and is supposed to have been the substance employed in dyeing the curtains of the Jewish tabernacle. As the colour which it yielded was more beatiful than the celebrated Phœnician dye, it may have contributed to have put an end to the monopoly of the Phœnician dyers.

The kermes yields a brownish red colour, which alum turns a blood-red tint. Dr. Bancroft showed that when a solution of tin is used with kermes dye, as with cochineal, the kermes is capable of giving a scarlet colour, quite as brilliant as that which cochineal produces, and to all appearance more permanent. But on the other hand one pound of cochineal will produce as much colouring-matter as ten or twelve pounds of kermes. Cochineal has supplanted kermes, and the latter is now only cultivated by the poorer inhabitants of the countries in which it abounds, especially in India and Persia, and the peasantry of Southern Europe.

Another species of Kermes (*Coccus polonicus*) is very plentiful in Poland and Russia, and is sometimes called the Scarlet Grain of Poland. Before the advent of cochineal, this insect formed a considerable branch of commerce. In the neighbourhood of Paris, and in many parts of England, the *C. polonicus* is found upon the roots of the perennial knawel (*Sceleranthus perennis*), a plant not uncommon in Norfolk and Suffolk. The colour which it furnishes is nearly as fine as that of cochineal, and capable of giving the same variety of tints. The insect was formerly collected in the Ukraine, Lithuania, &c., and though still employed by the Turks and Armenians for dyeing wool, silk, and hair, but especially for staining the nails of Turkish women, it is rarely used in Europe except by the Polish peasantry.

The same may be said of other species which the cochineal has eclipsed, such as the Coccus, found upon the roots of *Poterium sanguisorbis*, an insect formerly used by the Moors for dyeing silk and wool a rose colour; and the *C. uva-ursi*, which, together with alum, dyes crimson.

All these species owe their colouring property to a principle called Carmine.

G. E. COPE.

SCIENCE-GOSSIP.

THE first volume of Messrs. Whittaker's new "Library of Popular Science" will be an elementary introduction to astronomy by Mr. G. F. Chambers, whose larger works on the subject are well known. It is meant especially for readers who have no previous acquaintance with practical astronomy, and in this, as in other volumes of the series, considerable attention will be paid to efficient illustration and explanatory diagrams. The volume will be ready in the course of a few weeks, and will shortly be followed by others.

AT the general monthly meeting of the Royal Institution on Monday, July 6, the special thanks of the members were returned to Miss Jane Barnard, Dr. J. H. Gladstone, the Rev. A. R. Abbott, Mr. T. F. Deacon, Mr. A. Blaikley, and others, for the loan of the valuable and interesting collection of Faraday memorials shown in the library on the occasion of the two lectures on June 17th and 26th given in commemoration of the Faraday Centenary; also to Sir Frederick Abel, K.C.B. for his valuable present of an Œrtling Balance; and to Mr. Ludwig Mond, for his donation of £100 towards expenses connected with the Faraday Centenary commemoration.

DR. ROBERT WIESENDANGER, of Hamburg, has just patented a method of employing carbonic acid to produce intense cold, for the purpose of causing insensibility, which will prove particularly useful in dental operations. It is used in the form of a pencil, and any part of the body on being rubbed with this pencil loses sensibility, without the freezing of the skin; and slight surgical operations can then be performed without causing any pain. Dr. Krümmel experimented in the Hamburg Hospital on a boy of thirteen, who, without the slightest sign of flinching allowed him to make a long and very deep cut in his leg, the doctor having rubbed the place with one of these pencils. The process has the advantage of great cheapness, for fifty or sixty operations can be performed with it at a cost of from four to eight shillings.

Mr. A. Stanley Williams, of Sussex, has discovered three delicate but distinct markings in the equatorial region of Saturn. The first and third of these are round, bright spots, somewhat brighter than the white equatorial zone.in which they occur. The second is a smaller dark marking on the equatorial edge of the shaded belt which forms the southern boundary of the white zone. Mr. Williams has obtained abundant proofs of the reality of these markings, but points out that it requires patience and practice to see them readily. It is very desirable to obtain repeated observations of their times of transit across the planet's central meridian. To facilitate these observations, Mr. Williams prepared a table for June and July, showing the approximate mean time at which the spots might be expected on Saturn's central meridian.

Mr. W. Matthews sends us an illustrated paper of his on "The Determination of Personal Identity," by his methods of geometric identification and composite photograpic portraiture, which we recommend to all of our photographic readers.

We commend a new monthly publication to all book-lovers, "Bulletin Bibliographique de la Libraire Française."

Mr. Francis P. Pascoe has just privately published a neat little brochure entitled "A summary of the Darwinian Theory of the Origin of Species."

We have received Parts 13, 14, and 15 of Mr. R. L. Wallace's "British Cage Birds," the best book on the subject out (London: Upcott Gill).

On June 28th, about eighty members of the Essex Field Club had a delightful botanical walking excursion from Chelmsford to Maldon. At Danbury, in the midst of the old camp, Dr. J. E. Taylor, F.L.S., &c., gave an open air lecture on "Where our British Wild Flowers came from."

Dr. Hardwicke, surgeon to the Sheffield Public Hospital for Skin Diseases, who has studied cancer for a quarter of a century, believes that he has discovered a cure for this fell disease without the use of the knife. Professor Moritz recently described a treatment of cancer before the Society of Physicians Vienna, and from communications which have passed between him and Dr. Hardwicke, there seems to be much in common between the two systems.

Fishing with cormorants was recently carried out in the neighbourhood of Wethersfield, in Essex, within forty miles of London. The cormorants belong to Captain Salvin, a gentleman who has kept and trained these birds for many years. The two birds he brought down, by name "Sub-Inspector" and "The Artful Dodger," have been in his possession for the last nine or ten years. The fishing in English streams differs from the Chinese method, inasmuch as no boats are used, and the birds are turned into pools, while the shallows at either end are guarded by "whippers-in," clad in waders, who keep the birds under control, and catch them for the "master" when wanted. In the three days' fishing the cormorants caught over sixty fish.

Mr. Carus-Wilson writes to the "Chemical News" to say that he has now succeeded in producing musical notes from sand that was never before musical, and is also able to produce similar results from those mute, or "killed" musical sands which have been temporarily deprived of their musical properties. Full details will shortly be made public. The experiments have been conducted on the principles involved in the theory he propounded in 1888 to account for the emission of musical sounds from such sands, and that the results obtained appear to demonstrate indisputably the applicability of this theory. Professor Crookes adds a note, stating he had witnessed Mr. Carus-Wilson's experiments with musical sands—sands originally musical, musical sands which had been killed and then revived, and sands originally mute which had had the gift of music conferred on them.

We are pleased to draw the attention of students to Messrs. Dulau's scientific catalogues of second-hand books. The last is devoted to "Works on Geology," and runs to 138 pages. It is perhaps the most exhaustive geological catalogue of pamphlets, papers, etc., ever issued. Address 37 Soho Sq., W.

M. Elisée Reclus, the well-known French writer on scientific subjects, has been awarded a prize of £800 by a committee of the French Academy for his services in popularising science.

The medical officers at the Newcastle Infirmary have issued the result arrived at after seven months' treatment of the Koch "remedy" for tuberculosis. The cases of lupus, it is stated, have been improved; but in no instance has the condition been eradicated. In the cases of incipient tubercular phthisis, the disease was influenced beneficially for a time, but subsequently progressed. The joint and glandular cases were not favourably influenced.

MICROSCOPY.

To Advertisers.—The following is a quotation from a long letter just received from a new correspondent of Science-Gossip in India:—"It is useless my saying anything in praise of your paper beyond that *it* was the cause of my purchasing two microscopes, &c., for myself." *Verb. sap.*

The Journal of the Royal Microscopical Society for June contains, besides the usual summary of current researches relating to zoology and botany (principally invertebrate and cryptogamic), the following papers:—"New and Foreign Rotifera," by Surgeon V. Gunsen (illustrated); "A New Method of Infiltrating Osseous and Dental Tissues," by T. Charters White; and "On Bulls' Eyes for the Microscope," by C. M. Nelson (illustrated).

Mason's Improved Oxyhydrogen Lantern and Table Microscope.—We have much pleasure, after carefully examining this elaborately got-up, well finished, and yet marvellously compact instrument, in stating that it is the best and cheapest yet issued. It affords new scope for lecturing purposes,—botanical, zoological, or geological—the polariscope bringing out the colours of the lithological slides very clearly and effectively. This instrument has been designed to meet a long-felt want, *i.e.*, a microscope that can be used to demonstrate to a large audience, or, when not in use that way, easily converted into an ordinary form of table stand. This is done by merely slipping it off its lantern fitting and putting it on to another stand furnished with joint for placing instrument at any angle, having flat and concave mirrors, substage fitting tube of the universal size. One special feature is an improved form of object-holder; the springs are easily moved, and will hold with equal ease a thick zoophyte trough or the thinnest 3 by 1 slip; the objects can be moved about without the fear of scratching the labels, &c., an objection so common in the ordinary spring stages. The object and objective are clearly in view while focussing; this is of the utmost importance in photo-micrography, especially with the higher powers, also when using the camera lucida, the object is held gently but firmly in position, and can be readily manipulated. The optical parts have been specially worked out and give results equalling instruments costing several times its price. The various insect parts are beautifully pictured, sharp and clear to the edges. Living organisms such as hydra, daphnia, or other forms of pond life, are beautifully depicted, and can be shown either to a class or general audience. The instrument can be fitted to any ordinary lantern with 4-inch condensers. There are no screws or loose parts, so that the fear of losing screws is entirely avoided. All working parts are compensated for wear.

ZOOLOGY.

The Colouring and Banding in Land and Fresh-water Shells.—We have received another paper on this subject from Mr. S. Pace, who was away from England when Mr. J. J. Williams answered his criticism. Mr. Pace protests against "the free way" in which his article was altered; but the editor can in no instance allow any other than strictly scientific remarks. Especially will all personal ones be excised.

New Species of Kangaroo.—The latest discovered marsupial is the curious little burrowing kangaroo (*Notoryctes typhlops*), found in the heart of Australia, on the telegraph line between Adelaide and Port Darwin. The eyes are mere spots beneath the skin, so that it probably lives almost entirely in darkness, and it certainly digs a hole in the sand with amazing rapidity. It is the most mole-like of its order.

Hydrobia Jenkinsi, E. A. Smith.—Mr. W. Crouch has so completely answered Mr. W. H. Smith's note in the July number of Science-Gossip, that there is very little left to comment upon. It is, however, I think, necessary to point out to Mr. Smith, that supposing his friend was the first discoverer of the species, it would not affect its nomenclature, after Mr. E. A. Smith had so thoroughly established its claim to specific rank, after patient comparison and research. Mr. Smith's note certainly conveys the impression that he has but little acquaintance with the subject, and he certainly cannot have read the various articles which have appeared in Science-Gossip, and other journals, describing the new species, its first discovery, and habits and distribution, or he could not surely have overlooked the statement that I had collected the species some six years previous to Mr. E. A. Smith's announcement that it was a new species. My first specimens were obtained from ditches at East Greenwich marshes, June 19th, 1883: a few weeks later they were fairly abundant in that locality. Two or three years after I found a few shells only at Plumstead marshes upon several occasions, but they did not abound at that time according to my own experience. Immediately after obtaining specimens in 1883, I forwarded a number of them to various conchologists, asking them to name them for me. They were unanimous in pronouncing them to be *Hydrobia similis* of Draparnaud. It has of course been conclusively proved by Mr. E. A. Smith of the British Museum, that they differ nearly as much from this species as from the variety *ovata* of *H. ventrosa*. (See Journal of Conchology, vol. vi. p. 142). It is to be regretted that the mistake should have occurred, but no doubt it originated from the scarcity of authentic specimens of *H. similis*, which even at that period was fast becoming extinct as a British species, and it was the result of having to depend only upon general description, and obscure figures of species only. I believe Mr. Crouch must be mistaken in his impression "that further notes appeared in the Journal of Conchology for 1889, showing that the form had already been taken at Greenwich two years before (1887)." To the best of my belief the species had long since disappeared from the locality. In looking over my diary I find my last record of their being taken alive at East Greenwich marshes is July 4th, 1885, and subsequent search has failed to discover a single specimen in that district. I am of Mr. Crouch's opinion that the creatures have been introduced from abroad, and judging from the fact that they only appear to inhabit a few ditches at Beckton, and do not occur elsewhere in the Essex marshes, while they abound upon the south side of the river, and have been taken in abundance from ditches, commencing at the arsenal, and extending away down the river to a point midway between Darenth Creek and Greenhithe; I am inclined to think they were first introduced upon this side of the river, probably at or near East Greenwich marshes. I am confirmed in my opinion by the fact that the species does not appear to have been taken at Beckton previous to 1889, whereas it has been proved that they abounded all over the Plumstead marshes at that time, and were collected by me nearly six years before at Greenwich. How, or when, or where they were first introduced may always remain a mystery, but surely sooner or later the species will be discovered abroad. Professor E. von Marten, of Berlin, to whom in 1890, I sent specimens for the Berlin Museum, wrote me as follows:—"I thank you very much for the Hydrobiæ, which are very interesting for me; I know none which may be identical with it, in any part of the world. *Potomopyrgus antipodium*, Gray, from New Zealand, has a similar ridge below the suture, but this is often spinous, and it differs in other regards. I shall place most of your specimens in the Berlin Museum." One variety of this antipodean species in my collection strongly resembles *H. Jenkinsi*, but is scarcely identical with it, and the typical shells differ very much indeed. —*H. J. Jenkins, M.C.S., New Cross.*

BOTANY.

Albino Flowers.—In reply to Mr. Stewart's query, I am able to state that I have found albino flowers of *Erica tetralix* on one or two spots on the extensive heaths surrounding Aldershot. As it may be of interest to some of your readers, I here append a list of the Albino flowers I have at present in my collection. *Trifolium pratense*, *Epilobium hirsutum*, *Epilobium montanum*, *Calluna vulgaris*, *Erica tetralix*, *Centranthus ruber*, *Centaurea scabiosa* (this sometimes occurs with white ray florets and purple disk florets), *Scilla nutans*, *Erythræa centaurium*, *Salvia verbenaca* (foreign), *Origanum vulgare*, *Thymus serpyllum*, *Prunella vulgaris*, *Lamium purpureum*, *Ajuga reptans*, *Cnicus palustris*, *Orchis morio*, *Orchis maculata*, *Campanula rotundifolia*, *Dianthus plumarius*, *Geranium pusillum*, *Fritillaria meleagris*, *Veronica agrestis*, *Vicia sativa*, *Linaria cymbalaria*, *Primula vulgaris*.—*E. Armitage.*

Lemna trisulca, &c.—In June, on a Botanical ramble I dipped into a small pond, to inspect the plants growing there. On examining the Lemnæ, as I always do, to my great surprise I found *Lemna trisulca* unmistakably in flower. The flowers in every case existed on fresh young growths, never on any of older, fully formed leaves. In no other place, nor in this before, have I ever found these young growths, and never a single flower; but now I find myriads, and have observed them every way, by eye and under microscope. *L. gibba* seems to bloom here every year.—*W. O. Wait, Rugby.*

Erica Mediterranea in Cornwall.—Referring to the statement in Mr. Nower's interesting description of a "Ramble near Roundstone," that a spot in Galway, and one in Mayo, are the only British habitats of *Erica mediterranea*, I would take the opportunity of saying we have a specimen of this plant growing here in the Kennall Valley. It is a particularly fine plant, about five feet in diameter, and grows on the highway from Truro to Falmouth amid a brake of wood spurge, heather, and periwinkles. Its locale is closely adjacent to one of the branches of the Fal, but whether it owes its existence in this valley to the "rolling restless waves," or whether it was originally an inhabitant of one of the neighbouring estates, I leave an open question. One thing, however, is certain, that is, the plant has flourished here for upwards of thirty years. Not far from it its congener, *Erica ciliaris*, grows in all its glory.—*Fred. H. Davey, Ponsanooth, Perran-ar-worthal, Cornwall.*

An Abnormal Strawberry.—Perhaps you may care to insert the following note, if for the sake of the curious shape, in Science-Gossip. I saw it to-day amongst some strawberries I purchased. I have seen double and treble strawberries before, but never one that seems to be made up of six or seven, —I think seven, for one division is already decaying, but looks as if it had been in a way separate, while the leaves of the calyx at the back are very numerous. Perhaps, however, some of your correspondents may be able to tell us of oddities as strange among strawberries. This one comes from the suburbs of Bath, I imagine.—*F. S. Hollings.*

GEOLOGY, &c.

WELLS IN WEST SUFFOLK BOULDER-CLAY.—The following important communication was recently read before the Geological Society by the Rev. Edwin Hill, M.A., F.G.S. It might be supposed that in a boulder-clay district water could only be obtained from above or from below the clay. But in the writer's neighbourhood the depths of the wells are extremely different, even within very short distances; and since the clay itself is impervious to water, he concludes that it must include within its mass pervious beds or seams of some different material which communicate with the surface. It would follow that this boulder-clay is not a uniform or a homogeneous mass. The visible sections are only those given, at hand by ditches, and at a considerable distance north and south by pits at Bury St. Edmunds and Sudbury. The appearances in these harmonize with that conclusion. Conclusion and appearances differ from what we should expect on the theory that this boulder-clay was the product of the attrition between an ice-sheet and its bed. In the discussion which followed, Professor Prestwich remarked that intercalated beds of gravel and sand were common at different levels in the more northern boulder-clay, and that in parts of the Eastern Counties a bed of gravel, from one to twenty feet thick, generally occurred in the centre of the boulder-clay. These formed small water-bearing beds, but the main sources were usually at the base of the clay—a base which was extremely irregular. He asked the author how, as the wells stopped at the water-bearing stratum, he could be sure that this was, in all instances, intercalated and not an underlying bed. It was essential to know the level of the ground at the different wells, and this would no doubt be given in the paper. The component beds of the boulder-clay would vary according to the surface passed over by the ice, and may, therefore, include long trails of sands and gravels, and are necessarily local and irregular. He hoped that the author would continue his observations. Dr. Evans agreed with the author in regarding the mixed character of the boulder-clay of Suffolk and some of the features that it presents as being hardly consistent with its being merely the result of a coating of land-ice. In illustration of the permeability of the beds at certain spots, he cited the deep circular pits or meres in the neighbourhood of East Wretham, Thetford, which were due to the dissolution of the underlying chalk by water charged with carbonic acid having forced its way through the clay. The level of the water in these meres depends upon the saturation of the chalk, and the bottom of what in one year was a deep pool might in another year be cropped with turnips. Mr. Clement Reid observed that intercalations of seams of sand were almost universally characteristic of the boulder-clay, and helped to render it somewhat pervious to water. He was unable to follow the author's argument, that irregularities in the deposits proved that the boulder-clay could not have been formed under ice. Mr. Topley called attention to the researches upon the glacial geology of the Eden Valley carried on by Mr. Goodchild, who believed (as does Mr. Reid for Norfolk) that the irregular beds of gravel and sand occurring in the clay were formed within or under the ice-sheet, the gravel, &c., having been washed out of the clay into hollows of the ice during partial or local melting of the ice-sheet. Mr. Goodchild said that similar intercalations of sands and gravels in the boulder-clay were common in the north. He reminded the society that he had proposed an explanation of the origin of such deposits many years ago in the society's journal and elsewhere ("Quart. Journ. Geol. Soc.," vol. xxxi., and "Geol. Mag." for 1874). The president referred to his own early work in the boulder-clay, and the abundant evidence which he had everywhere found of intercalated nests and layers of sand and gravel in that deposit. He had always been accustomed to regard these intercalations and their singular contortions as affording some of the strongest proofs of glacier action, and though he admitted that the boulder-clay still presented many unsolved difficulties, he had never seen what he could regard as a valid argument against the view that the true typical boulder-clay is essentially a product of land-ice. The author, in answer to Professor Prestwich, said that he had taken into account the variations in surface-level of spots where wells existed. Dr. Evans's instances of permeability in boulder-clay were a valuable corroboration. The appearances of sections did not to himself suggest an origin such as erosion by subglacial streams. He would be very glad to study the sections at Saffron Walden and those in the Eden Valley described by Mr. Goodchild. He was not aware of any case in which a "ground-moraine" had been seen in actual process of formation, but he imagined that any structures possessed by a mass so formed would be horizontal in their general direction. The appearances described in the paper were not of that character.

THE GEOLOGY OF THE TONGA ISLANDS.—Mr. J. J. Lister read a paper on this subject. The islands of the Tonga group are situated on a long ridge which rises from deep water on either side to within a thousand fathoms of the surface of the sea. The general direction of the ridge is N.N.E. and S.S.W. (1) A line of volcanoes, some active, some extinct, traverses the group. Continued southward, the direction of the line passes through the volcanoes of the Kermadec group, and those of the Taupo zone of New Zealand; while to the north it cuts the line of the Samoan volcanoes at right angles. (2) Besides the purely volcanic islands there are some formed by submarine eruptions, whose layers have been laid out under water and since elevated, with or without a covering of limestone. (3) The remaining islands are formed entirely of limestone. Eua is an example of the second group. The volcanic basis consists for the most part of beds laid out beneath the sea, and some of the upper ones contain pelagic shells. Dykes of augite and hyperthene-andesite project on the shore, and a representative of the plutonic series occurs. There is evidence that the island has been elevated and again submerged prior to the elevation which has raised it to the present height. The volcanic basis is largely invested with limestone, and this rock forms the summit 1078 feet above sea-level. Sections show that it is a shallow-water deposit. Of the purely limestone structures, Tongatabu, Nomuka, and the long reef on which the larger islands of the Hapaii group are situated form more or less complete atolls, all of which have been elevated to a greater or less extent. The Vavau group is remarkable for its very indented contour, suggesting the idea that it rests on a much denuded basis. Both here and at Eua there are raised limestone formations with atoll or barrier-like contours; and there is some direct evidence to show that these have been formed without the aid of subsidence. The presence of islands formed of volcanic materials laid out in layers beneath the sea, and the manner in which the recently formed Falcon Island is now being reduced to the condition of a submarine bank, suggest that the atolls of the group may rest on similarly formed foundations. In the discussion which followed, Mr. Hickson said that Mr. Lister's researches on the coral reefs of the Friendly Islands were of great interest and importance, as they supported the view that atolls and barriers may be formed in regions of elevation, and that the "subsidence theory" is not sufficient to account for all the phenomena that occur in volcanic regions. The Tonga and Kermadec groups of islands are very similar to the chain of islands that stretches from the Northern Peninsula of Celebes to the southern promontory of Mindanao. Here we find a chain of volcanoes, many of them active at the present day, represented by the Ruang, the Siauw, and the Awu, with broad barrier-reefs and ring-shaped atolls in their immediate vicinity. The researches of Sluiter in the Java seas prove that coral islands and reefs are frequently formed on a substratum of soft clay and mud. Mr. J. W. Gregory remarked on the great value of Mr. Lister's paper, and the interest attaching to the discovery of a plutonic rock on the islands. Taken in conjunction with the discovery of similar rocks in the Marquesas, and the presence there of genera otherwise restricted to South America and Malaysia, it helped to afford an explanation of some difficult problems of distribution. Manganese nodules seem characteristic of deep-sea conditions, not only at present, but in earlier periods; thus in the Maltese Miocenes they are associated with a fauna of about 1000 fathoms. Their occurrence, therefore, proves considerable elevation, and it is not surprising that the coral-limestone occurs as thin crusts; the Tongas thus afford only another case of coral formation in shallow or rising areas, for which, as Darwin has so emphatically insisted, his theory was not proposed.

The Inverness Earthquakes of November 15th to December 14th, 1890. By Mr. C. Davison.—In this paper the author gives reasons for supposing that the Inverness earthquakes of last year were due to the subsidence of a great wedge of rock included between a main fault and a branch one; and he considers that there is little doubt that these recent earthquakes were the transitory records of changes that, by almost indefinite repetition in long past times, have resulted in the great Highland faults.

NOTES AND QUERIES.

Bats Flying in Sunlight.—In the early summer of the year before last, upon coming out of the church here at the end of the morning service, I observed two bats flying about in bright sunshine in the churchyard, resting now and then on the tiled roof of the south porch. It was the brightest, hottest day there had been that year up to that date, and I conjectured that their behaviour was due to the circumstance that their roosting-place under the tiles had become too hot for them.—*John Hawell, M.A., Ingleby Greenhow Vicarage, Northallerton, Yorks.*

Snakes and Parasites.—Are snakes troubled with parasites? I have never seen any mention of such being the case. For a considerable time I have kept several of the common *Tropidonotus natrix*, and until this week none of them have cast their skins this year. I took a skin out of the cage two days ago, which had just been cast, and was still fresh and moist. On looking at it, I found several lice of some sort crawling over the skin, but I brushed them off at once without thinking, as I wanted to preserve the skin. Last evening I found, in the space of about an hour, another fresh skin, which was also covered with the lice. I send this skin by Parcel Post just as I found it, that you may see the apparent parasites. I should be glad to know what you think they are. Is there any evidence as to snakes' hearing power? It always seems to me that they feel the vibration of a movement, more than actually hearing the noise of it. I might say that in other years I have never found any sort of insect on a snake's slough.—*H. D. Tilly.*

Marine Phosphorescence, etc.—During the first week of June was seen, off the south coast of Devon, one of the most beautiful natural phenomena it has ever been my privilege to witness. Across Torbay, beyond Hope's Nose to Babbicombe Bay, on to Oddicombe and Petit Tor, far as the eye could reach, the sea was dyed with brilliant crimson, which in the bright summer sunshine looked as if the water was turned into arterial blood, reflecting the light with a weird and wonderful effect. But it was at night the strange phenomenon revealed its full splendour. Then, right and left, far and near, the sea looked like molten silver, tinged with amber, and rich with gold. The far-off horizon was one long bar of glorious light, and as the waves broke upon the rocks, and the surge dashed upon the white pebbles of beautiful Babbicombe Bay, showers of phosphorescent spray were hurled high into the air, producing a spectacle grand in the extreme. The phosphorus which produced this magnificent sight was caused by the surface of the sea being covered with the spawn of the common mussel. When the tide was out, rocks, pebbles and sand were coated with a thin film of transparent gelatine, which speedily vanished with the light and heat of the noontide sun. What renders the phenomena peculiar is that I could find no trace of mussel-beds in the neighbourhood. The phosphorescent effects were greatest on the third night after the spawn was seen upon the water. In another forty-eight hours it had completely disappeared.—*Thos. S. King, F.G.S., F.R.M.S.*

TARDIGRADES.—Would any of your readers kindly inform me of the size of the tardigrade in comparison with the rotifers, cyclops, and such-like ordinary microscopical objects, and if they are visible to the naked eye? Also in what seasons and locality may they be looked for?—*H. J. T.*

OPTICAL EFFECT.—Can you give me the true explanation of the following optical effect, which I was shown the other day? Hold a lighted candle, in an otherwise darkened room, three inches below the eye, and two inches from the face, waving the light gently backwards and forwards while fixing the eye steadily upon the darkest portion of the room. Soon will be seen a black branched object which has been popularly likened to the ramifications of the brain.—*H. J. T.*

SNAIL-WATER.—Take garden snails cleansed and bruised six gallons, earth-worms washed and bruised three gallons, of common wormwood, ground ivy, and carduus each one pound and a half, penniroyal, juniper berries, fennel seeds, aniseed, each half a pound, cloves and cubebs bruised each three ounces, spirit of wine and spring water of each eight gallons; digest them together for the space of twenty-four hours, and then draw it off in a common alembick. This is admirably well contrived both for cheapness and efficiency, and for persons whose circumstances and manner of living have not habituated them to any delicacy. It is as good a snail-water as can be made, used for consumption.—*From an old Dispensatory of St. Thomas's Hospital*, 1746.

WHITE HEATHER.—In the July number Mr. Irving informs a correspondent that he had seen this variety at Wellington. In some of my rambles I have met with it in England and the Highlands of Scotland. While staying with a friend at Ilkley (Yorks.), a few years ago, we walked over Rumbolds Moor, which lies immediately to the south of Ilkley, and we came upon two large specimens in full bloom. I brought a sprig home, thinking it might be uncommon; but the landlady, with whom my friends were staying, assured us that there was plenty of it on the north side of Wharfedale also. Two years ago I came upon a very large bush in perfect bloom near Aberfoyle (Perthshire)—one solitary bush among a dense mass of the purple variety. The flowers were so profuse that, looking up the hill face, it looked like a big white boulder at half-a-mile's distance. Some years ago, in climbing a two-thousand-feet hill at Moy, between Inverness and Fort William, I found several plants of it in rather isolated positions—not growing beside the purple variety as I have since found it. In the many "weed-gathering wanderings" I have had in the south of Scotland, I have never come upon one bush of white flowers.—*Geo. Murray, Edinburgh.*

TREE-FROGS IN WINTER.—M. A. Y. wishes to know if any of the readers of SCIENCE-GOSSIP could tell her the best way of keeping green tree-frogs during the winter, when they are asleep and do not require food. Could any one also tell her how croaking sound is produced?

SQUIRRELS IN WINTER.—Some interesting remarks on squirrels are made by various writers in "The Zoologist." It is often said that squirrels are torpid during winter, but there is no really sound evidence for this view. Mr. Masefield, writing from Cheadle, Staffordshire, says ("Nature," March 12th): "I have seen squirrels abroad on fine days in, I think I may say, every one of the winter months; and while pheasant shooting near here on a sunny day (January 6th last), which was about the middle of the most severe frost we have had for many years, with several inches of snow on the ground, I saw a squirrel jumping from tree to tree, before the beaters, in the most lively condition." Mr. Blagg, also writing from Cheadle, has "frequently seen squirrels abroad in the middle of the winter, when there has been deep snow on the ground and a keen frost in the air. I remember," he adds, "once seeing a squirrel abroad during a severe storm of sleet and rain in winter time, and he appeared to be not at all inconvenienced by the rough weather." Mr. Blagg's idea is that the squirrel probably does sleep a good deal more in winter time than in summer, as do many other wild animals, but that he has to be continually waking up and taking nourishment. The period of reproduction is unfavourable to the notion of an almost complete state of torpidity. The editor of "The Zoologist" records that he has notes of "finding newly-born squirrels on March 21st (three young), April 9th (three young), April 26th (four young), and April 29th (two young). Those found at the end of March and beginning of April were naked and blind; those taken at the end of April were about three-parts grown." According to the editor "the old squirrels, in case of danger, remove the young from the nest, or 'drey,' to some hole in a tree, whither they carry them one by one in the mouth, just as a cat carries her kitten. One of the prettiest sights in the world is to see an old squirrel teaching a young one to jump."

MR. H. BETTANY, of New Zealand, desires me to inform those correspondents who sent him parcels of shells in reply to his notice in these columns, that he will send return parcels as soon as possible.—*F. W. Wotton, Cardiff.*

ARION ATER.—For the last four years I have been engaged in working out the life-history of *Arion ater*, with the view of learning whether or not it is self-fertilizing. I have now proved conclusively that it is. I purposely refrained from reading any works on this species during my observations, therefore do not know whether this fact has been placed on record before. I shortly intend publishing the whole results of my experiments and observations.—*F. W. Wotton, Cardiff.*

SNAILS AS A CURE FOR CONSUMPTION.—I can fully corroborate Mr. Rundle's testimony to snails being used by consumptives. Not long since there died at this place a young man who in early life fell a victim to this disease, but who, by careful attention to personal habits, managed to drag along to his twenty-second year. During the first two or three years of his illness the skill of all the local, and at least two or three metropolitan practitioners was called into requisition, but without avail, and eventually, on the advice of friends, who boasted of being competent to give a corporeal as well as an ocular demonstration of the virtues of the treatment, he entered heartily on a course of snail eating. The animals were eaten in moderate quantities twice per diem—morning and evening—and were collected for him while the dew yet bathed the herbage. The creatures consisted chiefly of *Helix nemoralis* and *hortensis*, and a small, slimy, shelless animal designated in this neighbourhood "the dew snail." Gruesome as the treatment may appear to our refined tastes, for three years it proved in this young man's case the only antidote to the ravages of consumption. I have a yet more remarkable case before my eye, this time that of a middle-aged man who has so far freed himself from the grip of consumption as to be able to carry on his business engagements. Several years since he was totally prostrated by this disease; in fact, his case was such as to excite the most alarming apprehension in his family. A course of vegetable diet and the snail treatment was prescribed, and adopted, and to-day, although not the strongest of men, as a merchant and general business-man he has no rival in his immediate neighbourhood. I may say that nearly twenty years have elapsed since he became free of his enemy. As in taking cod-liver oil, so in eating snails; what was at first a repulsive experiment becomes in time a toothsome pastime. Those who have undergone the snail-eating treatment, though the disease may have been successfully removed, and their case necessitates no further use of the animal, will eat them in quantities and with apparent relish. Like tomatoes, they seem to improve on acquaintance. I have never before heard of snails being used as "eye applications," but, as a remarkable fact, I have long known them to be used, and with unequivocal success, as poultices for gatherings. The snails are pounded into a jelly with a pestle of some kind, spread on a piece of clean linen, and applied like any other poultice.—*Fred. H. Davey, Ponsanooth.*

Frogs an Antidote for Bronchitis.—While the question of rustic recipes for virulent diseases is on the *tapis*, I would mention that in this neighbourhood the virtues of a young frog in alarming cases of bronchitis, like Cæsar's wife, has long been "above suspicion." The animal chosen for the occasion is generally about one inch and a half in length. The operator seizes the frog by its fore-legs, opens his own mouth to an alarming gauge, places the slimy creature in position, and heigh, presto! it disappears down his œsophagus! The philosophy of the treatment was an obscure point to me until a few weeks since a rustic lifted the veil by explaining that the frog in its endeavours to free itself from its uncomfortable position, "clawed away the phlegm from the windpipe, and thereby made breathing much easier." I have friends of unquestionable integrity who declare they have seen frogs thus eaten alive, with marvellous results to the health of the operator. —*Fred. H. Davey, Ponsanooth.*

Physical Human Measurements.—The common belief that woman has a proportionally longer trunk than man is not confirmed by the researches of the Professors of Hygiene at Amherst College, United States. Two thousand students of this great institution have been subjected to scientific measurements, with the result that although the average male is found to be only just over seven per cent. taller than the average female, in length of trunk he exceeds her by eleven per cent. In the length of the lower limbs there is a difference of nine per cent. in favour of the male. Where the female really outtops the male is in the head and neck.

White Heather.—Last year I procured two little white pieces of the true heather (*E. tetralix*) on a small expanse of moorland in N. Staffordshire. It may be of interest to readers to know it can be found in this county."—*B. C. Robinson.*

Coccus cataphractus.—H. A. asks (Science-Gossip for July, 1891) where this scale insect is to be found. Search among bog mosses in June. Ireland, Scotland, and Cumberland are good localities.—*C. Brooksbank*, 5 *Longridge Road, Kensington.*

The Cost of Fidelity.—"Sweep" is a collie some three years of age, very affectionate, and a great favourite. His attachment and fidelity to his mistress are very great. During a prolonged illness last year he scarcely ever left her room. Neither food nor water would tempt him, and neither nurse nor servant could drive him from a position underneath the sick-bed which he had appropriated to himself. A short time ago the poor brute's fidelity cost him dear. His mistress was suddenly called away by train. In the bustle of starting he escaped from home and found his way to the railway station. He attempted to enter the railway carriage, but was prevented and driven some distance off, where he remained until the train had started. He then came bounding down the platform, eluded the porters who tried to stop him, caught the train after it had left the platform, and looked up for his mistress. Failing to find her, he darted under the train, where he was seen to roll over several times, but eventually escaped on the opposite side with a smashed tail. The decision of the veterinary surgeon was that the tail must be amputated or the dog destroyed. Poor Sweep had been very proud of his tail, and used to curl it up over his back. He now has a stump about two inches long, and he may often be seen looking round as if anxious to discover what has become of the missing caudal appendage.—*F. T. S.*, *Worcester.*

Abnormal Flowers.—I enclose flowers of the common Canterbury bell, having all the sepals coloured like the corolla. The whole of the blooms on one large plant resemble those enclosed, and I may note that last year I saw in a friend's garden several plants of the same campanula, on which the sepals, also coloured, were joined at the edges, so as to form second and outer bells.—*Francis Brent, Plymouth.*

Dogs of War.—In France, Italy, Germany, and Austria, as well as in Bosnia and the Herzegovina, so-called war-dogs have been kept, in order to test their watchfulness for the benefit of the military service. According to general report, the plan has answered excellently with the outposts as well as with the patrol. But to the German army belongs the merit of having made use of the dog's sagacity for humane purposes in time of war, and it is probable that before long a number of fresh canine recruits will be permanently attached to the regiments, their office being to search for the wounded. The Prussian Jäger battalions have already a number of such dogs on trial, all of them being thoroughly trained to seek out wounded soldiers in the field. The experiments so far have had excellent results. A number of men hide in a wood or behind hedges, lying on the ground face downwards and with orders not to move. As soon as the dogs are let loose they begin the search. When they find one of these men they place their fore-paws upon the prostrate body and begin to bark, an exercise which is continued till the bearers appear and carry the man off, whereupon the dog starts afresh. Each company of the Lübben Jäger has about twelve of these dogs. Hunting-dogs cannot be relied upon on account of their love of the chase, and therefore sheep-dogs or Pomeranian Spitzhunde are chosen for the work.

Flogging Machines in Russia.—Flogging is so indispensable in Russia that some inventor has perfected a machine which saves the human arm the infamous labour of blows. Under the flagellation of the machine taxes and arrears are to become speedily collectable. "These latest fruits of Russian civilization catch the arm and feet, allowing the head to repose on a kind of Japanese pillow, while that portion of the body which is to be operated on is raised to a convenient position for the executioner."

Fatalities in the Crater of Vesuvius.—The brief period of quiescence in the cruption of Vesuvius has been followed by renewed activity and an increased discharge of lava. A few days ago, two Brazilian tourists, accompanied by a guide, ascended the mountain, and advanced to the mouth of the crater. They were soon enveloped in smoke, and when it had cleared away it was seen that one of the two had fallen into the crater, and that the other was in danger of doing so when he was rescued by the guide. It is probable that these gentlemen were overcome by the noxious fumes of the smoke by which they were surrounded.

Formation of a Dead Sea in California.—A geological phenomenon of considerable importance is stated to have appeared in San Diego County, in the extreme south of California in the almost sudden formation of an inland sea. A few weeks ago, a trickling of water was observed to damp the ground around the Salton Salt Works, and now it has expanded into a lake ten miles square, and from three feet to eight feet deep. Then at Indian Wells, sixty miles south of Salton, another new sea, forty miles square and from three feet to five feet deep, has been formed. It appears possible that these bodies of water may unite, and form a lake fifty miles long and 400 feet deep. Indian runners have been employed to go round the rising waters, and as they have failed to find any surface inlet, a boat has been provisioned for a week, and started to explore and try to discover the connection with the Colorado River, whence the water is believed to come, whether above ground or by a subterranean communication. The so-called Colorado Desert, lying to the east of the new lake, resembles the bed of a dead sea. It has an area of 3,000 miles, and lies 270 ft. below the ocean level. Shells and other marine deposits abound. Engineers have often planned to make this area fertile by irrigation, after the manner of the Valley of the Nile, which would add two million acres to the State, but all their efforts so far have been in vain. The Southern Pacific Railway crosses the Colorado River at several places 160 ft. above the ocean. For twelve miles near Yuma (Arizona City) only a loose water-sodden ridge nine feet high and a mile wide, separates the district from the Salton Sink. All the district appears now to be reverting to the condition described in Indian tradition. The stoppage of several artesian wells conflicts with the theory of a subterranean ocean, having a current running inland. The very idea of a "Subterranean Ocean" shows how much such engineers have yet to learn from geologists.

Wood-pigeons in London.—A great increase has taken place within the last few years in the number of wood-pigeons frequenting the London parks. Formerly a few pairs bred there every year, Kensington Gardens and the grounds of Buckingham Palace being their favourite nesting-places; but a few years since their numbers began to increase, and they are now—sparrows excepted—the commonest of London birds, and are certainly, without any exception, the most noticeable. Curiously enough, the greatest increase has taken place in the most frequented parts of the park. One of the most noticeable characteristics of the park pigeons is their excessive tameness, which seems to have grown as their numbers increased. They walk about unconcernedly within a few feet of the constant stream of pedestrians; and, especially in St. James's Park, are ever on the alert for the food which is often thrown to them; indeed, four or five may frequently be seen, in company with a small army of sparrows, almost at the feet of some person who is feeding them with pieces of bread or grain. The increase in the number of wood-pigeons has added a charm to the parks, as they are beautiful birds, whether seen on the ground or on the wing, and, though the London smoke and grime darkens the brightness of their plumage, it cannot destroy it. At this time of the year many young birds are about, which may easily be distinguished from their parents by their duller tints and by the absence of the white ring on the neck from which the bird obtains one of its names—the ring-dove.

Flying Machines.—Mr. Maxim's experimental flying machine is really a steam kite, thirteen feet long by four feet wide, and propelled through the air by a light screw making 2,500 revolutions a minute. When properly inclined and the screw going at a certain speed the kite moves horizontally through the atmosphere. With a higher speed it ascends, and with a lower it descends. The inventor is now engaged in building a much larger kite for practical purposes. It will be 110 feet long, by forty feet wide, and be driven by a screw eighteen feet in diameter. The power is to be supplied by a petroleum condensing engine weighing 1,800 lbs., and capable of raising 40,000 lbs., of load along with the kite. The estimated weight of the flying machine complete with two engineers on board is 11,800 lbs. Mr. Maxim therefore calculates on being able to carry ten or twelve tons of freight or passengers through the air.

Woollen Cloths and Dyes.—A technical journal describes the practice of the Donegal people in weaving woollen cloths which possess a grey colour derived solely from the natural colour of various grades of wool, being thus independent of dyes. This cloth stands the weather admirably, and is not encouraging for the tailor who sees in shoddy or mungo the means of a livelihood. The manufacturing appliances of the region are, however, very limited, and no large supply of such cloth is possible. Such market as exists for the production of such cloth is no doubt welcome to these primitive people. A similar practice exists on the Isle of Man of making use of black wool for home manufactures. The farmers in the hilly districts use the wool of the black-faced sheep for stockings, which are usually firmer, closer, and warmer than can be procured in any shop.

Torpedo Improvements.—The torpedoes now being made at the Austrian port of Fiume run below water at a rate of thirty-five miles an hour, and carry a charge of two hundred and forty pounds of gun-cotton, the explosion of which is so irresistible that probably no ship could endure it. What is more, the crinoline of steel rings which has been successful hitherto in keeping at a distance all smaller torpedoes yields, it is asserted, at once to the weight and impact of the large Whitehead implement.

The Rarest Metals.—Iridium, a very heavy metal of the platinum group, so named from the iridescence of some of its solutions, and well known in connection with its use for the points of gold pens, may be bought to-day at approximately £140 per pound. The present price of platinum, the better-known tin-white, ductile, but very infusible metal, is on a par with that of gold, namely, about £70 per pound. But generally its value fluctuates between its more popular brothers, gold and silver. The rarest metal—and it is so rare that recent discoveries have thrown doubt on its elemental character—is didymium, and its present market price, if one may thus term the quotation of an article that never appears on the market, is £900 per pound. The next costliest metal is barium, an element belonging to the alkaline earth group; its value is £750. Beryllium, or glucinum, a metallic substance found in the beautiful beryl, is quoted at £675.

Execution by Electricity.—Four criminals were put to death by electricity in New York a few days ago. No reporters were present, but it has transpired that death was instantaneous in each instance. The only witness who gives an account is the gaol chaplain, who says: "I was fully convinced that execution by electricity was a failure, but now I am equally convinced of the contrary. Every one of the men went to the chair calmly, and died easily without pain or contortion, death being instantaneous." The apparatus used was the same as that of last year, with improvements suggested by experience. There is no further question in New York about the method being in every way an improvement upon execution by hanging. The tested voltage of the dynamos used was 3,000, while the estimated voltage turned into Kemmler's body was only 750. The medical men present agree in saying that the executions were completely successful. Dr. Southwick says that death resulted instantly in each case, and was painless. There was not a burn or mark of any kind left on the bodies of the victims. Dr. Daniels says that the execution was highly successful from a scientific and from a humane standpoint. Every man is said to have died instantly and painlessly.

Trout and Viper.—Mr. Clay and Mr. Mead, two London gentleman, residing at Altnacealgach Hotel, in Sutherland, while fishing Loch Veyatie in the same boat, made, in one day, a total basket of twenty-six trout, aggregating ten pounds. The heaviest fish weighed a pound and a half, and on being opened it was found to contain a viper measuring eighteen inches in length.

Sir George Airy, the "doyen" of British scientists, has just completed his ninetieth year. Sir George is in excellent health, and takes the keenest interest in all matters connected with the astronomical and mathematical sciences to which he has devoted his life, and especially in the Observatory at Greenwich, over which he presided for nearly half a century. He tells a story, and repeats a ballad, as well and lively as if he were half a century younger.

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

A. V. Bennett.—We received your exchange for insertion and also your note, but neither contains your address.

F. Tyndall.—Get Stark's "British Mosses," with coloured plates and descriptions; or Hobkirk's "Synopsis of British Mosses" (no illustrations, but clearly-defined characters of all our species of mosses, which are much more instructive and lasting). You will then hardly require to trouble anybody. Or, if you can afford it, get Dr. Braithwaite's "Descriptions of British Mosses" (with plates, &c.) now being issued.

T. B. Cowap.—Your specimen of malformation in fuchsia is not uncommon. It is due to the usually scarlet calyx being transformed into a true green leaf, possessed with a mid-rib, veins, &c.—a genuine reversion. It may be observed in any garden just now, especially among the commoner and more neglected roses. That it is the calyx parts which return to their ancestral leaf condition before any other floral organs, is just what we ought to expect on the theory of floral whorls, suppression of internodes, foliar transformations to floral, &c.

T. M. P.—You cannot do better than procure the late P. H. Gosse's "Marine Zoology" of our coasts, if you want to go down to the seaside for pleasurable work. It is numerously, although sketchily illustrated,—enough, however, to help a student and would-be worker. We have no sympathy, in these days of abundant manuals, with those embryonic naturalists who send up the first, simplest, and commonest specimens they deign to gather to "be named." A million such recruits will never make one naturalist. They had all best stick to tennis.

B. C. R.—The "Botanical Gazette" is an American journal, published monthly at Crawfordsville, Indiana.

M. J. Taylor.—The tiger beetle (*Cicindela campestris*).

A Beginner.—1. It is not uncommon to find the feet of *Dytiscus* in the condition you describe. 2. Perhaps the pond which contained most duck-weed had most drainage leading into it.

S. A. B.—The "caterpillars" in the abnormal buds of *Cardamine pratensis* appear to be a form of red planarian, entirely new to us.

H. G. W. B.—It is exceedingly difficult to give you any account of where to find books, &c., relating to the entomology of Sierra Leone. You had best get Dalton's "Art of Travel," and the vols. relating to tropical butterflies and beetles in Jardine's "Naturalists' Library."

Miss C.—Address Mr. Charles Bailey, F.L.S., Ashfield, College Road, Whalley Range, Manchester, *re* "Botanical Record Club."

A. Bodington.—Your paper is duly to hand, and (although lengthy) shall appear in due course.

H. D. G.—Mr. Harcourt Bath's little book on British dragonflies does not possess coloured plates. It is a very cheap and good book, although the woodcut illustrations are not of the best kind.

A. V. Bennetto.—Your offer of exchange is inserted just as it came; but, as you will see, there is no address. Please send it to the Editor.

R. R. T.—Get Gosse's "Marine Zoology," in two vols.; also Landsborough's "British Zoophytes" (coloured plates).

T. W. X.—Spencer Thomson's "Walks and Wild Flowers" is an excellent and exciting book of its kind, leading many to botanical studies of a more serious character.

James P. Dixon (Northampton).—Mr. Beeby Thompson has published an excellent and important geological work on the geology of your neighbourhood.

EXCHANGES.

Net, setting-boards, collecting and store box, books, &c. What offers in useful exchange?—W. I. Weston, Beckley, Sussex.

Helix lamellata, *Pupa ringens*, and numerous other species offered for varieties of British land and freshwater shells. Also wanted, Continental and foreign land and freshwater shells.—Rev. John Hawell, Ingleby Greenhow Vicarage, Northallerton.

Wanted, eggs of raven, heron, puffin, teal, sea-mew, land-rail, golden plover, in exchange for British shells and seaweeds, or eggs of lesser black-backed gull, moorhen, pheasant, partridge, jackdaw, carrion crow, kestrel, hawk, and others.—A. V. Bennetto.

New micro-spectroscope, by Browning, 7*l.* Also dissolving apparatus of best construction, including oxy-hydrogen microscope, 25*l.*, including slides, &c. Particulars to intending purchasers. Address—Capt. S., Godstone, Surrey.

The following starfish with several crustaceans, also land, fresh-water, and marine shells (*Palmipes membranaceus*, *Astronyx Loveni*, *Cribella rosea*, *Cribella oculata*, *Solaster papposa*, *Goniaster equestris*; ditto, with 6 rays, &c. &c.), in good condition, ready for cabinet, in exchange for small insect cabinet duplicate cases, good works on British insects, or what offers? Send lists to W. D. Rae, 9, Claremont Terrace, Alpha Road, Milwall, London, E.

Anne Pratt's "Flowering Plants, Grasses, and Ferns of Great Britain," 6 vols., published by Warne & Co., what offers?—Linden, New Brompton, Kent.

Wanted, Science-Gossip, from commencement to 1889 inclusive.—E. Pratt, Worthendene, Streatham Common, S.W.

Wanted, an entomological cabinet with six to ten drawers.—W. F. K., 33, London Road, Maldon.

What offers for 60 micro slides, also for an electrical plate machine, 12 in., complete, with fittings? Wanted, good mammalian remains from any formation.—Geo. E. East, jun., 241, Evering Road, Upper Clapton, N.E.

Offered, shells, corals, *polyzoa*, *serpula*, sponges, banded flint, wood, geodes, chalcedony, *spicules*, *rotalia*, *lituola*, and other micro objects from the chalk, in exchange for minerals, recent corals, &c.—W. Gamble, 2, West Street, New Brompton, Kent.

Wanted, the vols. for 1869 and 1870 of the "Quarterly Journal of Microscopical Science," and any other odd volumes. Will give a collection of 300 or more British mosses in exchange.—J. Cash, Hereford Street, Sale, Manchester.

A number of botanical and histological micro-slides in exchange for others on zoology, or cash.—Apply to R. J. S. Wood, Seaview, Rosscarbery, co. Cork, Ireland.

Offered, *Xylophaga dorsalis*. Wanted, *T. cranium*, Argiope (all), Lepton (all), *Cardium papillosum*, *Astarte compressa*, *Psam. costulata*, *Donax politus*, Neæra (all), *Venus casina*, *V. striatula*, Aclis (all), Eulimella (all), Stylifer, Adeorbis, Torellia, Triton, Columbella, Marginella, Ovula, *Acera astyris*, Bulla, Aplysia, Pleurobranchus.—J. Smith, Monkredding, Kilwinning.

Lantern slides, illustrating geology, microscopy, &c., wanted for nicely-finished micro slides of whole insects, &c.—J. W. Neville, Wellington Road, Handsworth, Birmingham.

The undersigned would be glad to communicate with any-one who has done some work among Desmids.—C. O. Sonntag, 38, Maxwell Road, Pollokshields, Glasgow.

Wanted, exchange for rough materials, insects, snakes, &c., of Burmah, for books on microscopy. Beck's turn-table (or Aylward's), writing diamond, histological or other mounted slides, also a dissecting microscope with instruments; a fair exchange given if in good serviceable order. I shall be very happy to communicate with subscribers of Science-Gossip to exchange ideas or material.—W. F. Crews, c.o. F. F. & Co., Rangoon.

Wanted, rare British birds' eggs, side-blown. Will give in exchange a very nice aquarium, "The Entomologist," from 1883 to 1890, the "Field Club" for 1890, also British butterflies and moths, and several good breeding-cages for same.—T. Mottershan, 11 Manchester Street, Nottingham.

Polished geological specimens, rare British shells, rock specimens, thin sections of corals and sponges ready for mounting, recent objects. Wanted, *Isocardia cor*, and well-mounted slides of rock and diatomacæa.—T. E. Sclater, Bank Street, Teignmouth.

Will exchange five hundred different monograms for eggs of sea birds.—Fred. Soydell, 19 Chaucer Road, Acton, W.

Would any one having any duplicate natural history specimens or curiosities to spare, towards the formation of a small school museum, kindly communicate with J. A. Ellis, 1 Pomona Place, Fulham, S.W.?

Aclis unica, *Eulima bilineata*, *Eulima polita*, *Eulima distorta*, *Pleurobranchus membranacea*, *Scalaria clathratula*, *Cyclostrema serpuloides*, *Cyclostrema Cutlerianum*, *Odostomia interstincta*, *Venerapis iris*, *Spiralis retroversus*, *Odostomia spiralis*, *Odostomia nivosa*, *Adeorbis subcarinatus*, *Rissoa Zetlandica*, *Rissoa calathus*, *Rissoa fulgida*, *Tornatella fasciata*, *Mytilus edulis*, var. *pallida*, *Skenea planorbis*. What offers?—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

Wanted, books on literary history, or biographies, in exchange for Dana's "Text-Book of Mineralogy," and Strickland's "Memoirs and Scientific Writings," by Jardine.—R. McCully, 53 Ling Street, Kensington, Liverpool.

Wanted, good mineral specimens; volcanic rocks, Cambrian and silurian fossils given in exchange.—W. H. Banks, Ridgebourne, Kington, Herefordshire.

Larvæ of lepidoptera wanted, all kinds, for purposes of examination.—J. K. Homer, Townshend House, Sedgley, Dudley.

Wanted, "The Quarterly Journal of Microscopic Science" for October, 1886; also fresh or spirit specimen of *Coronella lævis*.—R. McKenzie Skinner, The Hollies, Shornden, St. Leonards-on-Sea.

Wanted, a few specimens of *Helix pisana*, *lapicida*, *obvoluta*, any Vertigo, *Clausilia biplicata*, *Rolphii*, *Acme lineata*, *Cæcilianella acicula*, *Cary. minimum*, and any vars. of same; offered in exchange, "The Conchologist" for 1891.—W. E. Collinge, 108 Woodsley Road, Leeds.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Handbook of the London Geological Field Class" (London: George Philip & Son).—"Our Country Flowers," by W. J. Gordon (London: Day & Son).—"Among the Butterflies," by B. G. Johns (London: Isbister & Co).—"Outlines of Field Geology," by Archibald Geikie, 4th edition (London: Macmillan & Co).—"A Summary of the Darwinian Theory of the Origin of Species," by F. P. Pascoe (London: Taylor & Francis).—"Journal of the Royal Microscopical Society," June.—"Journal of the Quekett Microscopical Club," July.—"The Human Epic," by J. F. Rowbotham (London: Kegan Paul).—"British Cage Birds," Parts 13, 14, and 15 (London: Upcott Gill).—"Annual Report North Staffordshire Field Club."—"President's Address to the Royal Society of New South Wales."—"The Microscope."—"The American Monthly Micro. Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Essex Naturalist."—"The Garner."—"Feuille des Jeunes Naturalistes."—"Journal of Microscopy," &c., &c.

Communications received up to the 12th ult. from: J. S.—A. M.—R. C. C.—I. C. S.—M. E. P.—W. T. L.—H. G. W. A.—H. R.—J. E. L.—H. J. T.—F. P. P.—H. D. T.—C. O. S.—J. H. G.—D. B.—T. S. K.—W. O. W.—A. M.—W. M.—H. R.—J. T.—C. B.—E. A.—J. W. N.—H. D.—F. F. S.—W. P.—W. D. R.—B. C. R.—J. S.—F. H. D.—F. B.—R. J. S. W.—F. W. W.—J. C.—E. M.—E. P.—W. F. K.—G. E. E.—W. G.—R. E. S.—G. S. S.—M. A. Y.—J. K. H.—F. J. P.—T. E. S.—A. J. R. S.—W. F. C.—G. E. C.—R. Mc C.—W. H. B.—A. J. J.—G. M.—J. A. E.—A. L.—W. W.—Dr. A. J. H. C.—E. B.—F. B.—J. M.—H. G. W. A.—F. S. H.—Rev. H. F.—G. D.—F. T.—A. H. S.—A. L.—R. McK. S.—R. C. C.—W. E. C., &c., &c.

NEW WORLD NATURE-LOVERS.

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

NO age or clime but has owned its spirits whose chief delight has been to coquet with fitful Nature, as the flirt dances attendance on the coy and blushing maid. With some, this love-making has been a mere passing whim, and when some more attractive object has flashed upon their vision, they have left their first or last plaything, as a child does its toys which pleased it yesterday, for a newer—albeit not always a worthier thing. Not so, however, with all. As the worthy knights of yore, who had been fascinated by the beautiful form of some Beatrice or Isabelle, were prepared to plunge into the arena where infuriated beasts were goaded to madness, that they might recover her fallen glove and thus prove themselves worthy of her hand, so have some of Nature's truest knights wooed her amid dangers, endured her frown, remained faithful when her purposes were least intelligible, and pressed her for the affirmative response, when it seemed as though her favours were to be for ever withheld.

While the almond-eyed daughters of China pluck the jasmine and fairy-flower merely to adorn the hair or add a grateful perfume to their person and apartments, the poet Leen is away among the rice-fields and bamboo groves listening to the song of the cicada and the call of the frog, weaving their discordant yet ever tunefully accordant syllables into intelligible sounds, and making the bird and reptile alike to speak in human strains. He praises the gold of narcissus, and the purple of cockscomb or peony; descants on the softness of the evening breeze as it moans in the cypress and pine; or goes into raptures as he recounts the wonders to be seen from the river-boat as it follows the tortuous course through defile and valley, through the haunts of the wild fowl, and the thick-peopled abodes of his brethren. China has her nature-lovers. Nor is this less true of the fair islands of the South, where man and maid alike are ready to sing the praises of orchid-epiphytes and weeping iron-wood, stringing together the while garlands of choice blossoms, producing sweet perfumes from the Makita, Bua, or Leba, and weaving their scanty garments from the paper mulberry or bright feathers of the Kula bird.

Who shall attempt to describe with what delight the Persian drink in the fragrance of the rose to the song of his native nightingale, and becomes an impromptu native poet under their combined influences? Or who will adequately picture the delight of the untutored, yet full-souled representative, of Asia's many tribes, when, as he sits by the Meinam and watches the glittering fireflies, or basks in the delights of Himalayan forest, and Burman plain, he surrenders himself to luxurious idleness, and sways his whole being to music of his own begetting?

These may not be recognized as members of the fraternity by your jargon-loving scientist: the naturalist who believes in having every beetle and bug named, and cabinetted in apple-pie order, knows them not; yet they are true nature-lovers, and are more in touch with the masses of their kith and kin, than all your world-enlightening doctors of science and professors of biology. These latter, worthy souls, who have created a scientific slang for their sole behoof—failing to understand which you must for ever remain outside the pale of the erudite and orthodox school—cannot believe it possible for nature's secret to be unlocked, save by their patent key, and utterly refuse to recognize the value of anything which is reported of the coy maiden, unless it be put in language which is good to swear by, and can have no duplicate interpretation.

They have forgotten the father that bare them and look not to the hole of the rock whence they were digged. The divine Aristotle and learned Theophrastus, because they presumed to speak of the rose and the lily in one breath, or divided plants into natural groups according to their size and life-duration, are cast off and treated with scorn, or "damned with faint praise." Who does not know (they ask) that the lily belongs to the monocotyledons, and the rose to the dicotyledons, while the perianth segments are petaloid in the one case, and in the other the flower is gamosepalous and polyandrous? How edifying such knowledge as this must be to the rustic youth! How much sweeter such harmonious sounds to the gentle maiden than the fragrance of the flower or the perfume of the attar!

Without for a moment wishing to depreciate the services which a technical terminology is calculated to render to science, who does not feel that we have too long been enslaved thereby? Some years ago I took a friend into the fields, and told him the names of the meadow florets, and the woodland earth-stars. I recalled some of the traditions relating to the wind-flower and primrose, told of the fairy favours which Shakespeare found in the cowslip, and the beauty the poets had seen in the daisy; and innocently looked into his face for some indication of pleasure. He was one of your orthodox schoolmen, who knew a daisy only as "one of the corymbiferous compositæ with conical receptacle and obtuse phyllaries." What was his amazement to find that I knew nothing of these beautiful terms, and had even presumed to study nature without first studying the scientific classification! Had I told him that I had learned to read Greek without committing the alphabet to memory, or had picked my way through Horace without having learned the whole of the irregular verbs, he would probably have thought the one equally improbable with the other; or if he had credited me with being truthful and honest, he would in all probability have pitied me for taking such an unauthorised course to acquire knowledge.

It is too much to say of the orthodox method of studying nature in the past—*Nous avons changé tout cela*—as Molière puts its; but it may with truth be asserted that the new-world nature-lover is doing a great deal to bring the change about.

Is it necessary for me to make the assertion that there may be nature-lovers who are not naturalists, just as there may be theologians who are not doctors of divinity, or flirts who are not real lovers? Do I need to affirm that the poet may know just as much about a celandine, and admire its golden chalice quite as largely as the botanist, though the one knows it only as the earliest of spring flowers, while the other can recognize it by petal or stamen, carpel or nectary, as one of the thalamifloral angiosperms, belonging to the order Ranunculaceæ and the class Dicotyledones?

One might have almost believed, and we could all have devoutly wished, that such books as "The History of Selborne," and "The Journal of a Naturalist," whose popularity has been great, would have led our scientific observers to adopt a similar style when presenting their discoveries and observations to the world. We are, however, proverbially slow in learning to adapt ourselves to the needs of the times. The man of science has a righteous abhorrence of pandering to popular taste. He prefers that his profound discoveries should be a secret to all, save to those who can plod through his cumbersome Latin—unknown of Livy and Catullus, rather than that they should be told forth in the vulgar tongue, and thus made cheap and common.

It is with no wish to ignore our new school of nature-lovers and their works that I refer to one or two American authors in the first place as types of the New World writers. My title is purposely selected to refer both to the geographical and the chronological. Where shall one begin. "Whittier," one has said, "using a humble vocabulary, exercises his gentle, though uneducated genius in finding natural beauties amid the hedgerows." Does not the same apply to many another writer from across the big pond? Did Walt Whitman ever attempt to pronounce the shibboleth of the honoured Asa Gray or Louis Agassiz? Yet who, wishing to be put at once into touch with nature, would not rather take a copy of Whitman's "Specimen Days in America," into his pocket, than carry with him "The Popular Flora" of Gray, notwithstanding all the illustrations contained in the latter?

Such a passage as the following translates us in a trice from busy mart and crowded street to the open glade and cheerful mead. "A while since the croaking of the pond-frogs, and the first white of the dogwood blossoms. Now the golden dandelions in endless profusion, spotting the ground everywhere. The white cherry and pear, blowing the wild violets with their blue eyes looking up and saluting my feet, as I saunter the wood-edge—the rosy blush of budding apple-trees—the light clear emerald hue of the wheat-fields, the darker green of the rye, a warm elasticity pervading the air—the cedar-bushes profusely decked with their little brown apples, the summer fully awakening, the convocation of blackbirds, garrulous flocks of them, gathering on some tree, and making the hour and place noisy as I sit near."

How like old Gilbert White in many respects is the annexed reference to the welcome spring emigrant. "Crossing the Delaware, I noticed unusual numbers of swallows in flight, circling, darting, graceful beyond description, close to the water. Thick, around the bows of the ferry-boat as she lay tied in her slip, they flew; and as we went out I watched beyond the pier-heads, and across the broad stream, their swift-winding loop-ribands of motion, down close to it, cutting and intersecting. Though I had seen swallows all my life, it seemed as though I never before realised their peculiar beauty and character in the landscape. Some time ago, for an hour, in a huge old country barn, watching the birds flying, I recalled the twenty-second Book of the Odyssey, where Ulysses slays the suitors, bringing them to *éclaircissement;* and Minerva, swallow-bodied, darts up through the spaces of the hall, sits high on a beam, looks complacently on the show of slaughter, and feels in her element, exulting, joyous."

Who would not be thankful for the giftie that should confer the power to see things thus? Who will not love the swift-flying birds the more when he has noticed the rhythmic motion of its wings and body, or watched it forming its graceful loop-ribands over the water?

Turn from Whitman to Thoreau. Do not carry with you the prejudice which the critic and reviewer have together within your minds by their unappreciative allusions, but open Walden and turn over the pages till your come to the Pond. "It is like molten glass, cooled but not congealed, and the few notes in it are pure and beautiful, like the imperfections in glass. From a hill-top you can see a fish leap in almost any part; for not a pickerel and shiner picks an insect from this smooth surface, but it manifestly disturbes the equilibrium of the whole lake. It is wonderful with what elaborateness this simple fact is advertised—this piscine murder will out—and from my distant perch I distinguish the circling undulations when they are half-a-dozen rods in diameter. You can even detect a water-bug (Gyrinus) ceaselessly progressing over the smooth surface a quarter of a mile off; for they furrow the water slightly and make a conspicuous ripple bounded by two diverging lines, but the skaters glide over it without rippling it perceptibly . . . . How peaceful the phenomena of the lake!"

After all what is science for, if it be not to bring man and nature to embrace each other rapturously, lovingly, responsively? And how can this be accomplished so long as we have only one language, and that the most repugnant and repulsive to popular taste, the language of text-books—with which to put the one on terms of familiarity with the other? Our poets can do, and have done a great deal. Longfellow's "forest primeval," Tennyson's wild flowers, Wordsworth's nature worship, have touched more hearts with a love for the beautiful and sublime than all your Manuals of Botany, Popular Histories of Science, and other well-meaning, but utterly unpalatable réchauffés of natural history.

Are we not after all getting back again to the days of Pliny, of Theophrastus, and of Dioscorides? What a delightful rusticity there is about the former writer as he mixes rape, parsnip, and squills, with mushrooms, madder, and cucumber all in one book, fringing his curiously wrought tapestry with marvellous facts relating to flax, and closing with instructions on the art of watering a garden! Your man of science scorns all such sublunary things as these latter, and for the former, he would have you put an impassable gulf between the crucifers and umbelifers, the cryptogams and phanerogams, the acotyledons and dicotyledons—not to mention others.

It is pleasant to know that in our own land the new-world idea is progressing. I should not like to appear invidious, but cannot forbear to remark that if America has her Burroughs, and Thoreau, as well as her Dawson and Gray (dead, yet speaking), we have our Hulme and Knight, Taylor and Worsely-Denison, as well as our Owen and Huxley. The one class honourably represent our naturalists, the other our nature-lovers, and while we look to the former for discoveries, systems, skeletons, we must give a warm welcome to the latter as they come forth into the open air, divested of all professional dignity, and begin to clothe the bare skeleton—"Can these dry bones live?"—with flesh and beauteous form. Every year is bringing the public into closer sympathy with nature, and when once the eye is opened to see, and the ear to understand the picture and the rhythm, but not till then, we may hope to find among the folk, a due appreciation of science and her exponents.

ON THE BURROWING HABITS OF THE GENUS TESTACELLA, Cuvier.

By C. D. Horsman, B.A.

HAVING been much interested in the observations of Messrs. L. E. Adams, W. E. Collinge, F. Rhodes, and B. Tomlin, which have lately appeared in the Science-Gossip and "Naturalist," I venture to forward some observations of my own on the above genus, which differ slightly from those of the above-named writers.

In speaking of *T. haliotidea*, Mr. Collinge says he has found it at a depth of from four to five feet, and mentions that Mr. Quilter found *T. scutulum* at a depth of eighteen inches. Dr. Jeffrey's mention of *T. maugei* not being from personal observation is open to question. Mr. Tomlin says he has found this last-named species from six to twelve inches below the surface.

I have carefully observed these three species, but have no record of ever having found any of them below twelve inches, and in the majority of cases only five or six inches below the surface. I have never noticed any "clean cut hole," as mentioned by Mr. Tomlin; all I have observed have generally commenced to burrow by burying themselves in the loose surface soil. I should like to know if they have ever been observed to use the burrows of earthworms, as if so, they may be able to reach a great depth, but this can hardly be termed burrowing as we understand the word in regard to the mollusca. It will be as well, perhaps, to mention that my experiments were carried out on a fairly heavy soil. In future observations it would be useful to state whether the soil is clayey, sandy, compact, or loose.—*The Conchologist.*

ROSSENDALE RHIZOPODS.

No. 4—*Continued.*

THE following notes and figures were unavoidably left out of Mr. Lord's last communication on this subject :—

Fig. 170. A common brown form, front and side views of *A. vulgaris.*

Fig. 171. A colourless variety, with a cancellated shell, approaching *A. dentata.*

Fig. 172. A beautiful variety of *A. vulgaris*, in which the summit and sides of the shell are depressed

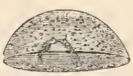

Fig. 170.

Fig. 171.

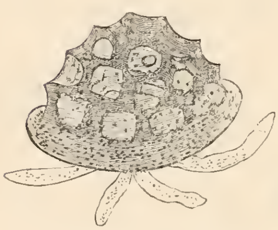

Fig. 172.—Arcella vulgaris.

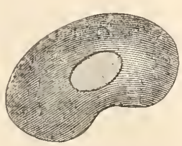

Fig. 173.

Fig. 174.—Arcella.

into a number of shallow concavities. Colour, light brown. Pseudopodia extended. Uncommon.

Fig. 173. An irregular or deformed specimen, dark brown.

Fig. 174. Large specimen, $\frac{1}{100}$ of an inch in diameter, with extended pseudopodia and numerous cont. vesicles. Colour, pale straw-yellow. From a shaded well.

My next contribution will be on the beautiful genus Nebela, and will be illustrated by numerous drawings of the chief varieties.

J. E. LORD.

Rawtenstall.

THE STANDING STONES AND DOLMENS OF CARNAC.

By A. H. SWINTON.

WHO would pass the sounding surge of Scylla and Charybdis unmindful of the songs of the Syrens? who would scorn the blandishments and rose-crowns that invite the wayfarer to the iron-bound coasts of Brittany? for there lies the Amorique point and portals of the Joyeuse Gard and the headlands and islands where the dwarf palm, orange, and camellia perfume the sunless northern skies. Over Bayeux, Mans, Font Evraud, and queenly Chinon, the vagrant raven has cast a sepulchral shade; but Castle Gaillard it has a merry note, the crickets creek it, the birds can chirp it, and the frogs will reply with a bagpipe drone, "Ha te zou Gaillard!"

Well, the bakers' strike is on, a number of the "Lanterne" and "Intransigeant" lies at my bedside, and a dream of mystery and terror starts up before me. Suddenly a rattling explosion shakes the hotel and I rush into the passage. What has occurred and who are the victims? A heavy smoke rolls up the staircase and there is a villainous taint of powder. I look out of the window over the probable scene of the accident and notice the Breton servant who is cleaning fish at the tap. Surprised at such sagacious conduct, I eagerly inquire what has happened, and I am given to believe that the landlord is endeavouring to remove a stone in his cyder-cellar. Presently I notice that the ceiling of my room is peppered over with little moths that hold their heads erect, and that a minute beetle that has drilled the wine-corks is disporting on the muslin curtains in the sun. After the smoke came up the locusts. I sally forth grateful that these are not clothes-moths, and walk down an elm avenue where the leaves hang like lace, and their edges are fringed with brown blisters. I pass onwards between hedgerows of pollard oaks and they are fluttering with the green tortrix; I pause beside a brown pool where the amorous dragon-flies who have knit the knot, shimmer like blue and carmine floss. It is the height of summer: come, let us stray through the meadows and visit the menhirs and dolmens of our ancestors that lie thick strewn around the Gulf of Morbihan; for see, the meadow brown butterflies have found a delight in the high and leafy hedgerows, and their hind-wings as they flit show the ermine border as though they had bleached them in the blinding dust.

Pause a moment now in this narrow lane and observe this pale small tortoise-shell butterfly, whose two wing-spots are barely perceptible, for it drinks deep on the purple thistle. Here though comes the herd-girl driving a couple of bulls with the most fearful horns, short, polished, and as sharp as needles. Now they are past, and we breathe as a childish voice exclaims, "They are not naughty," but from such terrible kine may the Lord deliver us. A rustic bridge conducts us onward to a grove of maritime pines, in whose cool shadow there is a sound of humming, we look up but no resin-bespattered insects swarm around their plumy tops. Is it the carol of a wood-nymph or the æolian breathing of the summer? for nothing is here vocal save the long-horned beetles that repose on the bark in the foppery of slothfulness. Stay a moment, for from beneath this glow of bloom whence a canary-breasted bird has this moment flown, there crawls a little dapper longicorn, whose antennæ are short and bead-like. All such have superior wits, and see how in response to the insulting straw of purple toad-flax, he opens wide his jaws and sounds his musical-box with a nid-nod of the head, just to tell us he is the chocolate-coloured *Glycerhiza* 4-*lineatum*.

But farewell to the restoring shadows, for we are now on the glaring high road, only differing from those on the banks of the Loire in being less sugary and more mustard coloured; could we dance in ring to the sound of the poet's flute and tread it with the bagpipes going on before, we might require our seven-leagued boots, for we have far to journey. At length a considerate haymaker suggests a short cut across the meadows, and propounds a problem as to how we must make for a larger village and keep a smaller one on the left, but dazed with the silken sheen of poppies and cockles alternating with blue-bottles and marigolds, we miss the stone steps and leaping a hedge and ditch alight like the gods of old, directly opposite a tavern where a mistletoe bough is hung out. The hostess greets us but strangely, You are not of this country; and as we sip the cognac and revivifying water a revery arises.

The traveller who crosses Brittany from north to south, passes by a bloom of orchards diversified with swamps and river-courses where the emerald shade of the oak finds a foil in graceful groups and lines of the white poplar; the ear instinctively catches the sound of "guy" entering into the names of certain of the villages, and he commences to notice that these pearl-bearing bunches that spring luxuriantly on the gnarly apples and smooth poplars are rarely noticed bearding the oaks, walnuts, or ashes; not indeed because the birds fail to place their germs there, but because they do not strike root. Now the Romans must surely have seen these tresses of the wood-nymphs hanging, as we do now, but it would seem probable that arriving in the frosty season, when the white-robed Druid, mounted on the naked boughs with his golden sickle, that they mistook the poplar groves self-planted beside the pools of Chartres, or on the green sod of Anglesea for the tall and lank oaks of Italy.

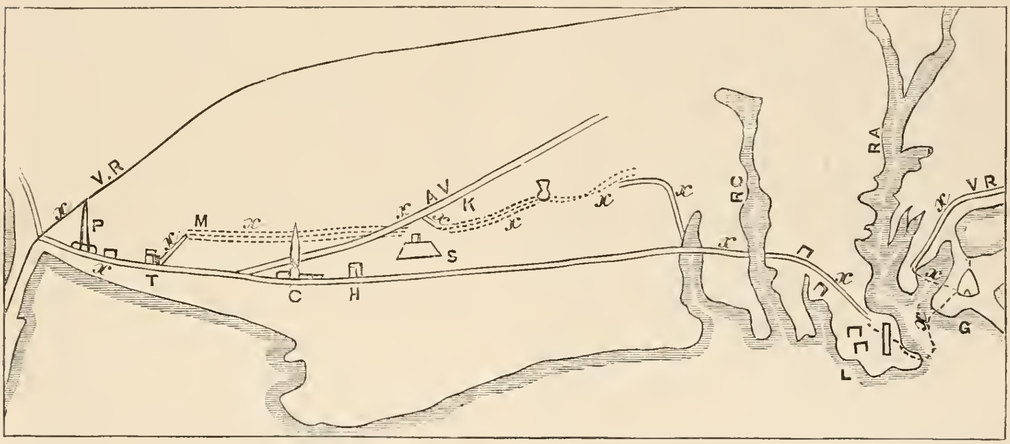

Fig. 175.—*x*, route to the principal monuments at Carnac; VR, road from Vannes; G, Gavrinis; L, Locmariaquer; RA, river of Auray; RC, river of Crach; K, stones of Kermario; M, stones of Menac; AV, road to Auray; S, Mont-Saint-Michel; H, Miln's Museum; C, village of Carnac; P, village of Plouharnel; T, tavern; VR, railway to Auray and Vannes.

But we must now really leave this elegant repository of cyder, cognac, beer and drinks innumerable, so much in advance of our drowsy public-houses, and so we anxiously inquire the way to the Gavrinis. The hostess, however, talks but little French, and she directs us to the next village, where we inquire again and are conducted to the baker. He has indeed heard of the Gaberine, but it is not near, and thus cheered we walk on so far that we do not know where we have got to; however, the spire of the village of Baden looms bluely in the distance, and here we at length arrive weary and a-hungered, and on entering a tavern a dish of the *Venus cardilia* (?)

is set before us. The dainty resembles a cockle, but is indeed very distinct, and an awkward pause hereupon ensues, when the village beauty with thickly-pencilled eye-lashes, dark eyes and ancestral cheek-bones comes forward, and wiping a knife on her apron she watches them hiss and splutter and protrude their syphons in delightful anticipation. The next moment she is bolting them like a cod-fish, and exclaiming, "Just as if they are not good."

The concluding portion of our walk lies through a pine clearing, along whose ferny borders the scarce swallow-tail butterfly is poising and floating, but it is yet a good league to the point, and the tide is quickly mounting and severing the Goat's Island from the mainland, so that we shall have recourse to the boat. The ferryman when we arrive is cooling himself on the floor of his cottage and drinking milk, and as we walk down to the quay he tells us that owing to our ignorance of the short cuts we have walked too far. He then takes us out in his flat-bottomed punt to his wherry ; a light zephyr sits in the flapping sail, and as we glide over the cerulean water the big tumulus behind the white cottages insensibly draws near. An avenue of wind-swept elms, some twelve feet high, leads up from the shore, which nevertheless he tells us has been planted these fifty years, for the dreamy shade of the elm does not increase like that of the aromatic conifer, and transform the scenes of our infancy: let us here find reason to pause and observe this minute ground-beetle, *Aristus capito*, that carries its prodigious head like a hippopotamus, its eyes too, seem placed at a disadvantage, and it is a puzzle to know what use it makes of its brains. But the tumulus where they tell us our grand-parents had a fairy grotto among the blooming furze is likewise a puzzle, it would seem. "Round about," exclaims a short, stout man, approaching with a tallow dip and a match-box, "hats !" By Saint Pol a not unnecessary warning, for it must have been with looks demure that the buried dolmen was entered. The match is struck and the light is paraded round the stony walls, revealing a kind of hatching, similar to the tatoo of the Pacific islanders, upon the slabs, which in the eyes of innocence might have presented the appearance of the ripple on the pebbles or the lines of nacre ; the jade instruments too, that chased it are also so faithfully represented that we suppress a tear, and then there are some zigzags. But what evidence is there that these lithe and nimble beings dwelt here ? we ask in breathless expectation. The short and stout man hereupon points to three coalescent holes suitable to hold a scent-bottle or wash the tips of your fingers, directly above which there is a blink of the blue sky, and he explains how they made use of these footings and crept in and out of the crevice like rabbits, for this was their only entry, Here it was then that the happy lovers lived, and here they were buried in right and possession of the Goat's Island, we exclaim half-convinced, with a romantic sigh.

The wind blows fair and it is a straight course across the misty river of Auray to Locmariaquer. The huge stones that stood there as a landmark are fallen and lie broken, but the dolmens remain, and the village children are waiting to show us where they lie hid among the blue-bottles and springing corn. As is often the case, a mound or tumulus directs us to the dolmens, and the children instinctively teach us how to creep in and show us where are the carvings. One resembles a turnip-top, but the hieroglyphics are with little doubt a hoax, like the Hebrew L. D. wanting an S. to be found somewhere.

Again we are on a straight glaring road with taverns at intervals, hearkening to the chirping of the field-crickets. Who can count the grains of sand and who can count the harpists here disclosed by the tepid spring ? but merry as they are on their native heaths, these musicians when imprisoned in a town, after a time cease to rejoice at the passing wheels, and remain mute until they die at the expiration of June. Whilst listening to the crickets we have passed by several dolmens that we might have visited, and we are now in the ferry-boat crossing the river of Crach, where tiles are made and converted into oyster cots. A fishing-boat with blue sails is coming in, coasting along the mud flats, and the two garreted cottages on the high banks recall the Scottish Highlands, and bring to mind the labours of an archeologist from the north country whose museum at Carnac we are desirous to visit, were it only for the sake of seeing the shapely stone hammer-head there exhibited. Reluctantly we leave this peaceful spot, and the same straight sandy road leads us onward until we come upon a shallow inlet parted into oyster-beds, and fringed with tamerisks. Here we mount the declivity on the right and skirt the dusky pine wood, but lost in the gloom we turn down a vista where a canopy of creepers veils the heraldry of a castle gateway. The sunlight idly slumbers on the white walls, extinguisher spires, and parterres within, and were the gardener to be seen we might enquire concerning the corkscrew variety of the garden snail, here to be looked for, as on the coast at Deal. But perhaps some of the dependants are about who will direct us to the standing stones of Carnac ; let us see. *Cave canem !* here they are to be sure, the bouncing mastiff with clenched teeth and prodigious howl in front, the spotted dog with bull-dog snout just behind, and all the rough-coated favourites with cocked-up ears bringing up the rear.

A backward retreat and a scurry down into a dell brings us upon the desired stones, standing up in long parallel lines like skittles, and we track them up a hillock crowned with a chess-board tower and over the smooth heath, and as we advance they increase in size until they rise about eight feet. We leave them behind after a hasty glance, and entering in at a wicket beside a cornfield gain the route to Auray, and proceeding down it come upon another battalion on the right, that for want of a Joshua, suggest to our untutored minds a game of hide and seek or a race-course. It has, however, been suggested that they are mementoes of some sort, or that they have even astronomical import: and truly in lands where the sun is glorious and stars are wildly and spiritually bright, temples and altars may have arisen at the music of the spheres, but while our churches are uniformly oriented, it cannot escape notice that Stonehenge faces south-west, while the lines of Carnac run south-east.

Having inspected something short of three thousand grotesque stones, old and new, suitable to recall to mind in the evening twilight the tale of the singing bird and the enchanted water, we turn into the lane on the left and gain the high road close beside the tavern of Ker Petit, where we inquire of a rustic the way to the railway-station at Plouharnel. I don't understand that Gallic turnabout. Indeed no, we have walked over thirty kilos. and desire to see the Dolmen of the Mane-Kerioned if possible before we leave.

NOTE.—It would be curious to inquire whether the late severe winter has produced many albino stoats, blackbirds, or meadow brown butterflies; intense cold by checking secretion must surely be the causation that here operates. In every case the white variety is white from the absence of the usual colouring-matter.

A RETICULATED AMŒBA (*BIOMYXA VAGANS*).

THE observation of *Biomyxa vagans* in Calcutta, is a sufficiently rare occurrence to justify me in placing a note of it on record. The scientific name of this interesting organism (from Gr. *bios*, life; *muxa*, slime: Lat. *vagans*, wandering about, or spreading out) accurately and concisely describes its character. The granular, glassy protoplasm of which it consists spreads itself out with a marked tendency to polarity, its pseudopodial extensions being mainly projected from its two opposite ends. These extensions are usually filaments, which branch and interlace freely, thus forming an irregular network which is constantly changing its form. The filaments are prolongations of the central mass, and are organically one with it. They here and there anastomose with one another, so as to form smaller expansions, comparable in all respects save size, to the main mass. It seems possible from the extreme fluidity of the whole, that any one of these small expansions may be continually fed by the flow from the main mass, till it becomes itself the main mass; and it is conceivable that the nucleus may, in this way, be left behind in the web of the pseudopodial net-work, as has been suggested to me by Mr. Wood Mason, and may thus escape detection. Along the glassy threads of the network, solitary or associated granules course with varying degrees of rapidity, and where most active at a rate exceeding that of the protoplasmic current (cyclosis) in Vallisneria. A lady to whom I showed the specimen under description in this note, said it looked as if it was pouring itself out into itself—a happy way of expressing the appearance of this interesting phenomenon. The flow in the thicker, and indeed in many of the finer, pseudopodia, as the projections or the extensions of the body-mass are called, and in the main mass itself, is in opposite directions on the two margins; while in many of the finer filaments minute, elliptical, or fusiform particles of protoplasm glide like rain-drops along a telegraph wire. Numerous minute vacuoles appear in the central portions, and some also in the pseudopodial extensions and their knot-like expansions. There is no distinction of the body-substance into an outer, or cortical, denser protoplasm (exoplasm), and an inner, more fluid, medullary protoplasm (endoplasm), the animal being of the same highly fluid consistence throughout; nor is a nucleus to be detected, though this last feature may be due, as already suggested, to the nucleus having been left stranded, as it were, somewhere in the reticulated pseudopodial expansions.

Three or four diatoms—a species of Cocconeis which is abundant this season in the tank from which Biomyxa was obtained by me—and one or two stray filaments of a minute green Alga were imbedded in the protoplasm of the main mass of the organism observed by me.* The same water was also the habitat of numbers of minute flagellated monads, bearing two flagella, one trailing behind and the other projected forward; and I watched with interest several in which the anterior flagellum seemed to have become caught in the current of the protoplasm, flowing in the reticulated filaments; these organisms were clearly being towed along the pseudopodia, and three or four were observable, with careful focussing, in the central mass of the organism; but it could not with certainty be made out whether they were imbedded in it, or were merely adhering to its surface. A larger monad, with only a single flagellum, constantly swam up to the circulating mass; touched it repeatedly, and as it seemed intentionally, with its whip-like appendage; and released itself without apparent difficulty or effort. My objectives are not of sufficiently wide aperture to admit of my detecting the flagella of the Bacteria, but several Bacteria were being swept along by the marginal protoplasmic current; and from their motions as compared with those of the Flagellata referred to above, it seemed obvious that they too

* Diatoms appear to have formed the chief nourishment of Haeckel's *Protomyxa aurantiaca*. See Vol. IX., "Quarterly Journal of Microscopical Science," pp. 40 and 42.

were being held by their flagella in the circulating protoplasm of the filaments. Numbers of Bacteria and minute monads were lying perfectly still in the vicinity of the web of Biomyxa, apparently dead.

Biomyxa vagans—as I have termed it, because I consider the organism found by me identical with the one described by Leidy at page 281 et seq., of his work on the 'Fresh-water Rhizopods of North America'—was discovered by me in a glass bowl of water and weeds (Anacharis and Vallisneria), taken from the tank on the Calcutta Maidan, which is known as General's Tank. The water was drawn on the 1st February. On the 22nd of the month, I had roughly teazed out a decaying leaf of Anacharis with needles, and was searching over the slide for organisms, supplying the loss by evaporation from time to time, when I noticed an Entomostracan lying temptingly still, and commenced to sketch it; while thus engaged, I detected a granular flow in a delicate filament of protoplasm near the edge of the field. This was quite two hours after the water had been first placed under the cover-glass, and under observation. Following up the flow of granules along this filament (which I found anastomosed with others in its course), I was presently led on to the main central mass above described. This was a little after nine o'clock in the morning. The organism was under observation all day, and when it grew dark towards evening, I washed it back into the bowl from which it had been taken; but though I have carefully searched, I have not succeeded in recovering it, or in finding another like it. I should add that the water in the bowl in question has been always rich in Heliozoa, Difflugiæ (*D. pyriformis*, *D. acuminata*, *D. corona*), Arcellæ, and Amœbæ of various kinds, among which last *A. princeps*, *A. radiosa*, *A. limax*, and *A. guttula* have already been identified.

The accompanying sketches have been made from the organism direct, with the aid of Beck's vertical camera. At nine o'clock, or a little after, the organism presented the appearance delineated in fig. 177. Its extensions already spread considerably beyond the sheet of paper used for the drawing, and had commenced to anastomose. The organism varied in form from moment to moment; and hence, while the figures were being sketched under the camera, portions already traced had altered slightly in contour, while those actually under delineation had themselves doubtless changed from the form they had at the instant the sketch was commenced. At noon, or a little after, the organism had obtained its fullest extension and activity: it pervaded altogether four or five fields of the microscope; and I have endeavoured in fig. 176 to delineate the anastomosis or interlacing of the protoplasmic filaments, using for this purpose two different powers (fig. 176 × 250; fig. 179 × 370). At this time I was able to trace the network through a complete circuit in one direction—judging from the objects, such as *débris*, etc., in the vicinity; it was a development of the main protoplasmic streams which enclose the great mesh which bounds the clear space marked A in fig. 177. Fig. 179 represents the protoplasmic

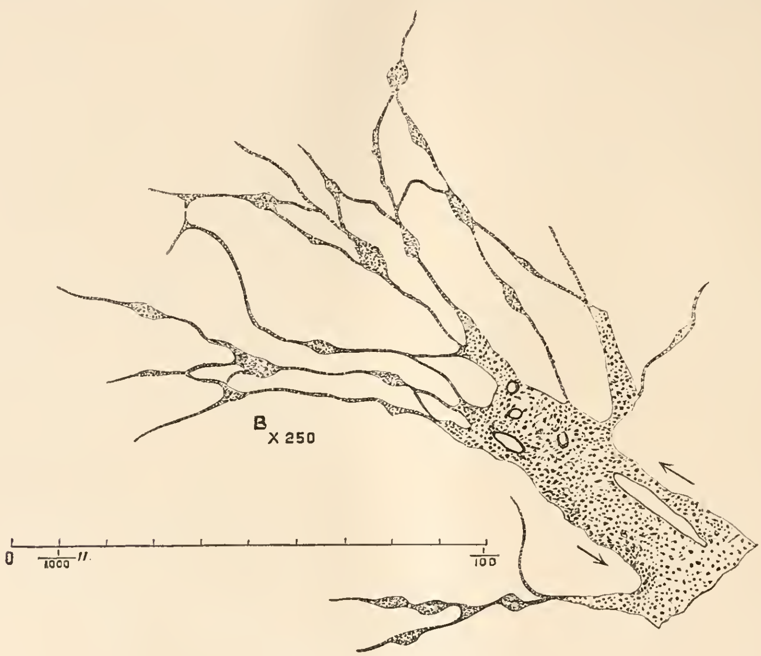

Fig. 176.—*Biomyxa vagans.*

reticulations nearly furthest away from the central mass of Biomyxa. At four o'clock in the afternoon the body had contracted in all directions, probably because there was a deficiency of oxygen in the water-supply, for the salts held in solution had formed the usual whitish incrustation round the edges of the cover glass. Spherical nodules appeared on the central body; the flow of granular matter became very feeble; and the pseudopodial extensions were

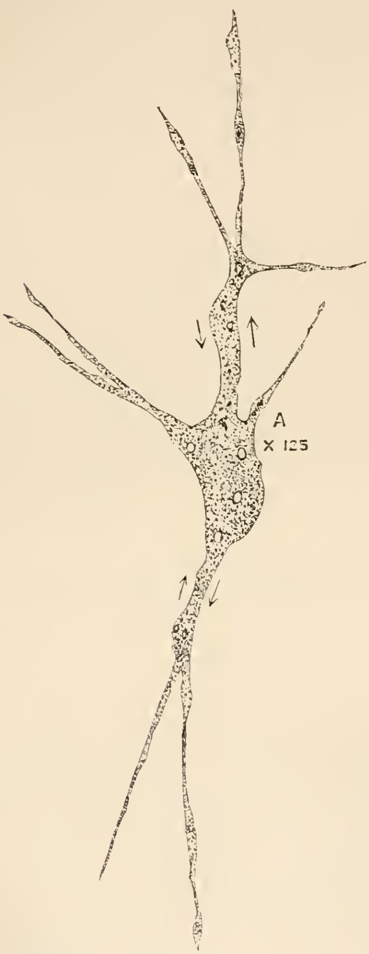

Fig. 177.—*Biomyxa vagans.*

greatly contracted and reduced in number. Fig. 178 represents the organism at this stage; and before my fourth drawing was completed, two additional small, but growing, nodules, which are not represented, had formed, one at each end, and on opposite sides of the body.

The micrometric scales which accompany my sketches will enable the student to determine the dimensions of the organism: figs. 176, 177 and 178 are drawn with a power of 250 diameters, fig. 179 with a power of 370 diameters. The main mass at 9 A.M. would roughly have been about one-fiftieth of an

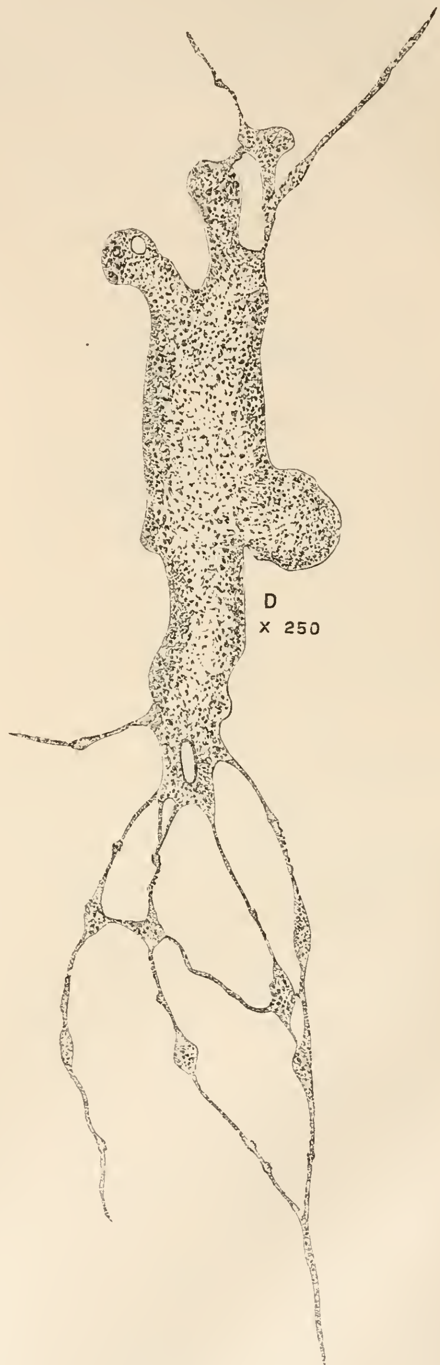

Fig. 178.—*Biomyxa vagans.*

inch from end to end, exclusive, of course, of the filaments composing the net-work. At 4 P.M. it was about one-seventieth of an inch in length, but its increased opacity betokened that it was denser, and probably thicker, than it had been at any time in the forenoon, while three or four large and vigorous Amœbæ may sometimes be seen disporting themselves in a single field of the microscope; Biomyxa with its delicate reticulations fully developed pervades four or five fields.

Adopting the most recent classification, the systematic position of *Biomyxa*, according to Bütschli, would be: *Rhizopoda;* Sub-order I., *Amœbæa;* Family *Amœbæa reticulosa;* Genus *Biomyxa* (Leidy); there being at present but one

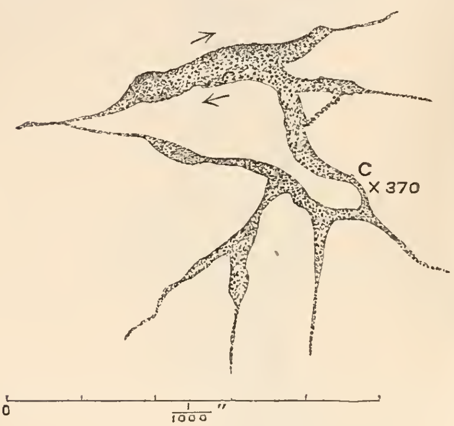

Fig. 179.—*Biomyxa vagans.*

species found in the fresh-waters of North America, and we must probably add, of India. In this connection, the presence or absence of a nucleus in these low forms of life is a matter of importance. If a nucleus be present, as it is in the true Amœbæ, we have an organism in at least its original sense—a whole constructed, as Haeckel puts it, from dissimilar parts, viz., an inner nucleus, and an outer cell-matter. If, on the other hand, no nucleus be present, then Biomyxa stands amongst what Haeckel has termed the Monera, "organisms without organs;" bodies which in a physiological sense can still be called organisms because individual portions of them fulfil the essential life-functions of all true organisms, nourishment, growth and reproduction. He considers that in these homogeneous, structureless albumen-bodies, spontaneous generation is more easy of conception than it is in the case of a true cell, possessed of a division into plasma and nucleus. Here we may note that the experiments which are so widely held to disprove Abiogeny, or spontaneous generation, dealt rather with the Bacteria than with the Monera. The Monera, according to Haeckel, may "be classed with equal propriety, or rather with equal arbitrariness, as primitive animals, or as primitive plants": in other words, they may "just as well be regarded as primitive animals or as primitive plants"; and this authority would accordingly consign them to a separate kingdom of primitive forms, the Protista, an ill-defined domain which he places between the animal and vegetable kingdoms. The Monera, then, according to Haeckel cannot with confidence be predicated to be either animals or plants. Leidy himself was not free from doubt with regard to the position which should be assigned to his Biomyxa. He says "It has also been a question with me whether to regard it as a true Rhizopod, or whether to view it as the plasmodium of a fungus. In structure and habit, so far as observed, it seems to accord with the latter rather than with the former, though I have not detected a coalescence of individuals in Biomyxa. Cienkowski has described several organisms related with the latter, of which he regards one as a fresh-water plasmodium, while the others are viewed as Rhizopods;" that is, as animals. Leidy goes on to say that Cienkowski describes a form of naked rhizopod, with the name of *Gymnophrys cometa*, which resembles Biomyxa, but differs from it in having no contractile vesicles; in which respect, again, Leidy says, Biomyxa differs from the nearly related Leptophry of Hertwig and Lesser. For ourselves it is safest, at any rate provisionally, to accept Bütschli's classification given above; and to recognise with Haeckel, that "we are just at the beginning of our knowledge of these very interesting primordial forms."

W. J. SIMMONS.

Calcutta.

NOTE.—This paper was read at a meeting of the Microscopical Society of Calcutta on the 9th March, 1891.

NATURAL HISTORY NOTES.

SEEING the account of a diseased rook in the January number of SCIENCE-GOSSIP, I thought I would send the following extract written in 1887.

There has been much mortality among the rooks this winter in this neighbourhood. Under one rookery of about fifty couples of birds, about twenty rooks were picked up dead, or were so weak that they could not fly, and were thus easily killed. A small rookery round here, which had nearly a dozen nests in the spring of last year (1886), now contains only one nest. At the beginning of the present season there were three, but the rooks from another locality came and destroyed two of them as they were finished. One couple went and built in the rookery from whence their depredators came; the other single couple continued for a short time and then forsook.

Two other rookeries, one containing about forty-five nests, and the other thirteen, now contain sixteen in the largest and only six in the other. The number of rooks are thus reduced to about half their former number.

One that I found in a field, could only hop, being quite unable to fly, and another one was found shortly afterwards in the next field in the same condition. The weather at the time was severe, but the cause of this mortality was undoubtedly disease.

NOTES FOR APRIL 1890, BEING AN EXTRACT FROM A LETTER.

The greater and lesser periwinkle were both in flower the beginning of this month. Lilac leaves also about this date; and the hedges are now getting forward in leaf. Young rooks were hatched about the 1st of April, as I find by egg-shells thrown out of the nest. What a large quantity of sticks the rooks drop when busy building, either from their not being suitable, or by accident! There is enough wood lying under a few elm trees (which contain a small rookery of about eighteen nests) to last a person for lighting a fire every morning for a fortnight. Snowdrops and crocuses have all disappeared now from our gardens. An interesting fact connected with the Christmas-rose I have lately observed in our garden. This plant was in flower about Christmas-time here, and were all faded away, when about the end of March I saw with surprise another flower half opened, which had shot forth from the stem where the flowers of December had died off, and now (April 7th) I notice others on some of the other stems, so that it seems as if it flowers twice in a season. There is now nothing more pleasant than to ramble through the meadows on a clear evening at this time of the year. The rich and clear song of the blackbird reaches us from some leafing hedgerow a little way off, where he sits perched on the top of some bush, cheering his less dusky spouse, as she is keeping guard over her blue eggs, snugly placed in the nest at the bottom of the bush. During the second week of this month the currant and gooseberry bushes came into flower. Ground-ivy was in flower on the 9th, song-thrush with young on the 10th. Fieldfares I observed on the 13th, also a large flock of them the day before. Cowslips were in flower under hedges on the 13th, and dog-violets and wood-anemones were in flower on the same day. The ivy-leaved speedwell abounds amongst the green corn in a cornfield called "Mill-ditch." Blackthorn was in flower on the 13th of this month along the hedge at the bottom of the same field.

MAY.

The trees are now putting on their summer dress, and the hawthorn scents the evening gales. The anemone, primrose and violet have faded away, but others have taken their places, such as the blue-bell, or wild hyacinth, purple orchis, germander speedwell, and tormentil. The birds are as yet singing merrily in the hedges and groves, but in a few months' time all our singing-birds will be silent with the exception of the wren and redbreast. The blackthorn has faded from the hedgerows, its place now taken by the milk-white hawthorn, which looks in its full as if a snowstorm had been and left great bunches here and there in every hedgerow. Sometimes the flowers of the hawthorn are pale red, which look lovely in contrast with the white. The apple-trees and the wild apple or crab are now looking their best, soon in their turn to wither and die.

(*To be continued.*)

THE LUMINOSITY OF PLANTS.

By Canon Russell.

WILL you kindly allow me to bring under notice some facts connected with the luminosity of plants which have been recently attracting my attention? I became acquainted with them quite accidentally, in the following way.

On the evening of the 16th of June, 1889, I happened to be taking a stroll round the Rectory Garden, and passing by a fine plant of the common double marigold (*Calendula officinalis*) of a deep orange colour, I was struck by a peculiar brightness in the appearance of the flowers. After watching for a few seconds, I observed, to my great surprise, that corruscations of light, (like mimic lightning) were playing over the petals. Thinking that I might be only the victim of an ocular illusion, I brought out other members of the household, and asked them to report exactly what they saw. Some perceived the flashes readily enough, but others only slowly and after patient observation, all eyes not being equally sensitive to such rapid vibrations of light.

These performances commenced about 8.30 P.M. and continued for perhaps under an hour. I afterwards ascertained, that much later on, when it was almost dark, the whole plant seemed to glow with a sort of pulsing phosphorescence. The common nasturtium, and the scarlet geraniums showed a like luminosity. Closely connected with their appearances, I could distinctly see a blue vapour of extreme tenuity given off from the leaves of some of these plants, if not from all, in open daylight or under lamplight. This can be best seen by holding the leaf against a dark background, and letting the light fall upon it at various angles. These two last phenomena were not as readily detected by other persons as were the sparks of the marigold. They were made, however, abundantly evident to all eyes in the following way. I put a leaf of the nasturtium on the stage of a microscope—and, having focussed it for the central spot from which the nerves branch off, under an inch and a half objective, I brought it into a room nearly dark. Looking at it then through the microscope I found that the leaf could be distinctly seen almost by its own light. The appearance of the luminous vapour floating over its surface (like moonlight over rippling water) was strikingly beautiful. The whole leaf seemed to twinkle with points of light—the main ribs radiating from the common centre, shining out like a silver star. These effects are best witnessed after a day of hot sunshine. Some further facts and suggestions which may point to a possible explanation of these phenomena I reserve for another paper.

REMARKS ON DISTYLA, WITH DESCRIPTIONS OF THREE NEW ROTIFERS.

By David Bryce.

IN a recent article (Science-Gossip, Sept. 1890), my correspondent, Mr. J. E. Lord, expressed his suspicion that the genus Distyla is not a good one, and he described as Cathypnæ two forms of which he remarked that, "when retracted they are undoubtedly Cathypnæ, when extended as certainly would they be described as Distylæ." He further

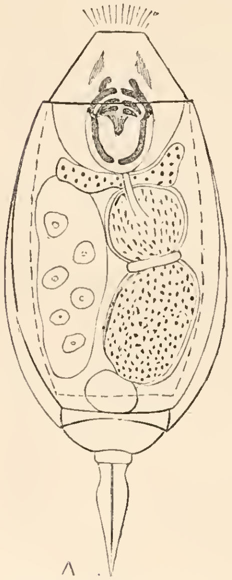

Fig. 180.—*Distyla depressa.* Dorsal view, extended.

Fig. 181.—Ditto, lateral. × 320.

suggested that some if not all of the species of Distyla are but extended Rotifera of the genus Cathypna.

I had hoped that ere this some other observer would have been induced to plead the cause of Distyla, but, behold, Jove thundered and lesser tongues were mute.

For myself, I cannot claim to have examined more than five or six species of the two genera in question, and my remarks are perhaps to be regarded as provisional rather than as final. Yet there are points indicated by Mr. Lord, which, I think, should not be allowed to pass without comment in the pages of Science-Gossip.

I would first point out that, by some misunderstanding, Mr. Lord assumes that Mr. Gosse's phrase "habitual protrusion of the head," refers to some inability of the rotifer to withdraw its head between the plates of the lorica. It is true that the figure (after Ehrenberg) of *Distyla Horne manni* in "The Supplement" represents this species with its head protruding and its cilia extended, although otherwise much retracted, but I am inclined to deny credence to that remarkable position until I see some Distyla assume it. On the contrary, Mr. Gosse's words can only mean that as compared with the very sluggish, timid or indolent habits of the Cathypnæ, the Distylæ are more usually active and less prone to indulge in naps (?) when under observation. All the Distylæ I have seen were perfectly able to retract their heads within the lorica plates.

In the next place, Mr. Lord appears to have overlooked the fact that Eckstein founded the genus

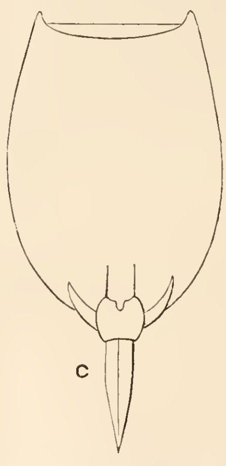

Fig. 182.—Ditto, ventral view.

Fig. 183.—Ditto, brain. × 540.

Distyla in 1883; and it has therefore priority over Cathypna instituted by Mr. Gosse in 1886, at the same time that he set apart the family of the Cathypnadæ, to include not only Cathypna, but, inter alia, the Distyla of Eckstein, which he thus distinctly accepted and confirmed. If, therefore, the distinctions set up between the two genera were shadowy or insufficient, it would be the genus Cathypna that would have to give way, not the genus Distyla.

Again, if a species be so balanced between two genera as to appear to belong to one when extended, and to the other when retracted, there can be no question that the extended position being the natural one, the species must be assigned to that genus to which it conforms when extended or active, and I submit that on Mr. Lord's own showing, his two species are certainly Distylæ, and his description and figures as certainly indicate that genus.

I observe that in his quotation of Mr Gosse's remarks about Distyla, he omits the word lengthened. Mr. Gosse says "the lengthened and flattened form." The omission is of course unintentional, but the character is important and fits Mr. Lord's species.

As to the distinctions between the two genera, these have been set forth in such a plain and concise way in the criticism of Mr. Lord's article which appeared in the December issue of the Journal of the Royal Microscopical Society, that I may perhaps be permitted to quote the sentence for the benefit of those who have no opportunity of seeing the original. "In Cathypna the whole trunk is loricated and the creature when extended is dorsally arched; but in Distyla only the hinder portion of the trunk is loricated, the forepart having a membranous covering and the creature, when extended, is comparatively flat, or, as it is termed, depressed." Save that the writer omits to draw attention to the usual outline of the two genera when extended, Cathypna

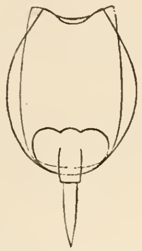

Fig. 184.—*Monostyla arcuata.* Ventral view. × 320.

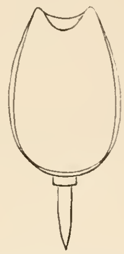

Fig. 185.—Ditto, dorsal view.

being generally ovate, and Distyla of the form of a long ellipse, the above sentence perfectly and briefly summarises the points of difference.

All other points in the generic characters are, I think, either common to both genera, as "lorica closed behind, toes two, selvage-like thickenings of the lorica around the foot," or of secondary importance as depending upon individual estimate, such as lateral inangulation strong or feeble, or of habit, such as "the habitual protrusion of the head" and "the more constant activity." All these may be safely disregarded, when there are present the leading characters pointed out in the sentence quoted.

There appears to be some confusion as to the meaning of the term lorica, in respect of the genus Distyla. I am not myself quite clear that it ought to be restricted to that portion of the covering of the trunk, which appears to remain stiff and hard when the animal is retracted. I have found that different individuals of the same species do not always retract to the same degree, that whilst at one time two short lateral points (as described in many species) are easily visible, at another time the retraction will be less complete and no points are to be seen; and I have found dead specimens of the same species, from which the head and all interior parts have vanished, yet displaying an apparently permanent shell much exceeding that shown in retraction. I conclude that the restricted use of the term may be convenient but is possibly incorrect, and that the absence of the two lateral points is a character that especially requires careful verification.

Although among some genera of the Rotifera mere size is an unsafe guide to identification, there are others in which, regard being had to mature individuals only, the dimensions of the different species are closely adhered to. Among the Cathypnadæ I have found the variation to be very slight, not I think more than 10 per cent., if so much. It would therefore be an assistance to those who hope

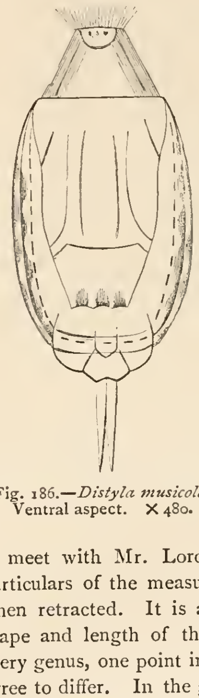

Fig. 186.—*Distyla musicola.* Ventral aspect. × 480.

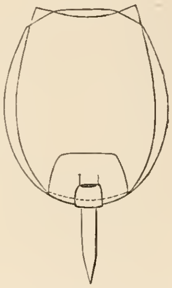

Fig. 187.—*Monostyla cornuta.* × 320.

to meet with Mr. Lord's forms, if he would state particulars of the measurements when extended and when retracted. It is also useful to know the exact shape and length of the toes. There is in nearly every genus, one point in which the species appear to agree to differ. In the genus Macrotrachela it is the spurs, in Distyla and Cathypna the toes.

I append descriptions of two species, which appear to me very distinct from any of those yet described, and of a Monostyla closely related to, but not identical with, the common and well-known *M. cornuta.*

Distyla depressa.

Sp. Ch.—Lorica much flattened, ovate, truncate at both ends; anterior edges, ventral excised in moderate curve, dorsal straight; two short lateral points shown in extreme retraction; dorsal plate shorter than ventral and narrower behind; toes blade-shaped, acute, slightly decurved; brain three-lobed.

The lorica is very flat, the average thickness of fairly matured specimens being rather less than one-fourth of the length of the dorsal plate. It is free from flutings or tesselation and moderately firm. In retraction the outline of the trunk is scarcely altered, the proportion of loricated to membranous covering being unusually great. In lateral view some irregular wrinkles are visible in the integument lining the lateral infold, which is well-marked (see dotted lines Fig. 180), although the plates are but little separated. The dorsal plate, while in front as broad as the ventral, is rather narrower behind, and is abruptly and somewhat convexly truncate. The ventral plate is excised anteriorly, permitting the head to be bent down as shown in lateral view. The outline is posteriorly completed by the dilated basal foot-joint, which appears to be almost fixed and to have even less freedom than usual in the genus. It is difficult to trace lines indicating the junction of this joint with the trunk on either dorsal or ventral side, but those I have shown are, I think, correct. Indeed, the joint is little more than a partly shelly, partly membranous framework protecting and supporting the sub-square lower foot-joint, which issues from the under side and pivots on a blunt point arising from the ventral plate. The toes, seen vertically, are widest at the base, are then slightly pinched in, again widen and finally taper to acute points without either claws or shoulders. This curvature is confined to the outer edges; the inner being quite straight, yet with a slight rugosity near the base. Seen laterally the upper edges are decurved and the lower nearly straight.

The ample brain is in front bluntly pointed, but widens into three lobes, of which the central is the greatest and bears near the inner side at its base the bright rose-red eye. The wedge-shaped outline of the prone face is interrupted by two knob-like projections whose nature and origin I have been unable as yet to determine. The powerful mastax is well forward, and I believe I have seen the jaws slightly protruding into the buccal cavity. An œsophagus of moderate length is attached to the inner side of mastax and passing down it, proceeds to the stomach, the lower part being in constant and rapid undulation. The stomach, surmounted by the usual gastric glands, is separated by a distinct constriction from a capacious intestine, and in both ciliary action is apparent. The vascular system embraces lateral canals, at least three pairs of vibratile tags, and a small contractile vesicle having a short period. Two band-like muscles pass from the head down the back. Length;—total, $\frac{1}{110}$ inch, toes about $\frac{1}{550}$ inch, breadth $\frac{1}{270}$ inch.

In a gathering made in March 1890, from the River Lea, below the Lea Bridge Waterworks, and which I had placed on one side, I found some months later a flourishing colony of Rotifera. The species were few but very select, the most conspicuous being *Adineta oculata*, only hitherto found, I believe, near Aberdeen. Along with it were many examples of this Distyla, some *Callidina elegans*, and some others. The three forms named continued to flourish up to the end of November, when the severe weather wrought havoc among the colony. The Distylæ succumbed, but the other two species survived and now after thirteen months the stock seems fairly vigorous. It is noteworthy, that the supply of water has never exceeded two ounces, any loss from evaporation having been simply replaced from time to time from the household supply, that no artificial feeding was resorted to, and that no pond weeds were present, the plant side of the balance of life being represented principally by Scenedesmus and a scanty growth of Oscillatoraceæ.

Distyla musicola.

Sp. Ch.—Lorica ovate, flattened, both anterior edges truncate, almost straight, two very short lateral points seen in utmost retraction. Dorsal plate rather broader and longer than ventral, and rounded behind. Ventral plate with a definite and shelly central portion almost plane, from which a less stiff integument recedes laterally to the edge of the infold, and posteriorly merges into that of the dilated basal joint of the foot. Toes, tapering, acute, without claw or shoulder.

Numerous dead examples have occurred amongst the sediment of water drained from Sphagnum, but I have only as yet found one living specimen. The remains seen have however shown the creature in every position, and I find that as in *D. depressa* the outline of the trunk is not greatly changed by retraction, and that extended the form is that of a long oval, rather than that of an ellipse. The head is wedge-shaped, the face rather prone, and the mastax normal. Some very delicate markings can sometimes be seen on the shelly portion of the ventral plate. The membranous lining of the infold is so wrinkled as to give a peculiar scalloped appearance to the lateral margins. The basal joint of the foot is as in *D. depressa*, but even less distinct. The lower joint is much narrowed at the base. The blunt point on which it pivots, appears however to arise from the upper joint and not from the ventral plate. The toes are thickest just above their middle and taper thence to fine points. They appear straight in vertical view, but seen latcrally, they are slightly decurved, with upwards-turning points.

Length, extended, estimated at $\frac{1}{200}$ inch; retracted $\frac{1}{266}$ inch; breadth, $\frac{1}{300}$ inch; toes, $\frac{1}{1000}$ inch.

Habitat, among roots of Sphagnum, Epping Forest.

Monostyla arcuata.

Sp. Ch.—Lorica ovate, moderately depressed; occipital edge shallowly, pectoral edge deeply excised in somewhat bow-shaped curve. Toe rather blade-shaped tapering to an acute point, without claw or shoulder.

This species resembles very closely the widely distributed *M. cornuta* and differs from it principally in being about one-fourth smaller, and rather narrower in proportion, and in having both the anterior edges of the lorica excised and to a greater degree. Mr. Gosse states that in *M. cornuta* the front of the lorica is shallowly incurved, that the anterior dorsal edge is slightly less incurved than that of *M. lunaris*, but that the ventral edge has its margin quite straight. I think that here he is slightly in error, and partly on this account, and partly for the sake of comparison with the figure of the new species, I add an outline of the ventral aspect of the lorica of *M. cornuta* when retracted. This position (not figured by Mr. Gosse) shows the straight occipital edge and the very slightly excavate pectoral edge of the lorica as well as the large basal foot-joint. In the numerous examples I have examined, the occipital edge has always seemed straight and the pectoral slightly excavate, and this structure is exactly what would be necessary to facilitate the bending downwards of the head.

In any case, in *M. arcuata*, the excision of both anterior edges is much sharper than in *M. lunaris*. In all other details, in general aspect when extended, and in its sluggish habits, the species is the counterpart of *M. cornuta*, yet the differences noted, though minute, are constant, and I consider fairly entitle the form to rank as distinct.

Mr. Gosse gives the length of *M. cornuta* as $\frac{1}{150}$ inch extended. The largest specimens I have measured were about $\frac{1}{173}$ inch, and the average $\frac{1}{180}$ inch, while *M. arcuata* in the like position averages $\frac{1}{240}$ inch, the lorica alone being about $\frac{1}{350}$ inch. I have found dead specimens very abundantly among the drainings from Sphagnum and I have recently had for a little time a colony in a jar, the bottom of which was covered with some threads of moss, gathered last year and now springing into fresh growth.

My sketches show a broad and a narrow form, apparently the extremes of variation, the former being probably a more mature individual. Young specimens resemble when slowly gliding along, the form which I take (yet with some doubt) to be the *M. mollis* of Mr. Gosse, which however when in retraction s not to be distinguished from *M. cornuta* and is therefore equally distinct from the present.

Habitat among roots of Sphagnum, Epping Forest.

NEO-DARWINISM.

By A. G. Tansley.

I.—The Question at Issue.

ARE we still justified in holding Mr. Darwin's conclusion that "habit, or use and disuse, have in some cases played a considerable part in the modification of the constitution and structure ;" * or should we rather consider, with a more modern school of naturalists, that this supposed factor in the transmutation of species is unproven and unnecessary ; unproven because the hereditary transmission of characters acquired during the lifetime of the individual has never been experimentally established, and unnecessary because we can explain the phenomena of organic evolution without invoking its aid ?

Such is the question which, of all others, is now engaging the attention of the biological world. Closely connected with it is the consideration of Professor Weismann's brilliant contributions to the existing literature of variation and heredity, including a theory of heredity absolutely inconsistent with the conclusion of Mr. Darwin which we have quoted. For the last two years and a half, that is since the discussion on the transmission of acquired characters raised by Professor Ray Lankester at the Manchester Meeting of the British Association in 1887, in which Professor Weismann himself took part—this subject has been prominently before English naturalists. During this period there has been no paper or discussion on the subject, hardly even a reference to it, in the pages of Science-Gossip.* It is obvious that the question is one of the deepest interest, affecting, as it does, the very foundation of our conception of organic evolution. If the "Lamarckian" factor, as it is sometimes called, is a true factor, it must have played an important part in the modification of species. If we are to reject it altogether, a large number of phenomena will have to be explained in other ways ; in fact its rejection will entail a more or less important modification of the Darwinism of Mr. Darwin. Apart from these considerations, Professor Weismann's theories of heredity, variation, etc., which differ essentially from those hitherto generally held, are concerned with matters lying at the root of any explanation of evolution. I therefore thought that a series of papers on the subject, which should aim at setting forth, as briefly as possible, the various problems involved, would be of interest to those readers of Science-Gossip who may lack the time or inclination to study the subject more deeply. The method I propose to pursue is, first to state clearly the main question at issue, which turns on the truth or falsehood of what is known as Lamarck's "second law," and to sketch the present position of opinion upon it, then to give an outline of Professor Weismann's hypotheses on the subject of heredity and variation, and finally to try and show the exact bearing of these theories on the question with which I started.

We will commence our brief account of the position of opinion on the subject under discussion, and of how it came to be what it is, by stating the question at issue and then defining our terms. The question in its most general form is: "Can an 'acquired' character be inherited?"

* "Origin of Species," 6th edition, p. 114.

* The above was written in April, 1890.

Now it has been sometimes objected that to deny the inheritance of acquired characters is equivalent to denying the possibility of all modification in descent, since every new modification must be "acquired" by the species at some period of its existence. This objection is, of course, based upon an initial misconception of the recognised meaning of the word "acquired" in this connection.

By an "*acquired*" character is meant a character which is not in any sense present in the fertilised ovum from which the organism it belongs to was developed, *but is acquired by that organism at some period after the first cell-division.*

An *inherent* or *congenital* character, on the other hand, is a character *which does exist potentially in the fertilised ovum before the first cell-division.*

The question before us can then be expressed concisely as follows: "Can an acquired character become congenital?"

It is well-known that Erasmus Darwin * and, later, Lamarck † conceived the idea that species are not immutable, and that the individuals representing them at the present day are descended from other simpler forms; that Lamarck explained this process of evolution chiefly by an innate tendency to development along certain lines, partly by the growth of organs in response to a desire on the part of the animal, and partly by the transmission of the effects of increased use and disuse, of habit, or of the direct effects of the environment. It is clear that the last class of means of transmutation indicated is the only attempt at a scientific explanation of the phenomena in question; of the other explanations, the first is essentially unscientific, and the second is too preposterous to need discussion. The last suggestion is, however, in quite a different position. We know that as a matter of fact increased use or disuse of a particular part has, during a single lifetime, a considerable effect on that part; and we are familiar with changes produced in an individual by the direct effect of the environment. What more natural than to suppose that such considerable changes are hereditary, and that in course of time their accumulation will effect a modification of specific rank? So thought Lamarck, and he accordingly formulated his "second law:" "Everything that nature has made individuals acquire or lose by the influence of circumstances under which their race is placed for a long time, and consequently by the influence of the predominant use of a particular organ, or by that of a continual falling off in the use of such a part, she preserves by the act of generation to the new individuals which follow, provided that the acquired modifications are common to the two sexes, or to those individuals which have produced the new one." ‡ It is obvious that this "law" is quite inadequate to account for *all* the phenomena of organic evolution. It offers, for example, no explanation of all the complex and wonderful phenomena of adaptation. As we have seen, it only furnished a small part of Lamarck's explanation. His philosophy completely failed to convince the great mass of thinking men of the truth of evolution. Goethe was perhaps the most notable and enthusiastic of his few partisans; but later on, as Mr. Herbert Spencer tells us,* there was a small band of evolutionists in England who accepted Lamarck's second law as at least a partial explanation of that transmutation of species which they believe had taken place. For the rest they were totally at a loss. Hardly a biologist or geologist agreed with them. Sir Charles Lyell had argued brilliantly against Lamarck: Mr. Huxley was a firm anti-evolutionist. Then came the "Origin of Species," with the luminous principle of natural selection, which has effected so profound a change in the attitude of the world to the doctrine of evolution, and which is too familiar to need exposition here. We may, however, point out the great and fundamental difference between the Lamarckian and Darwinian theories of evolution. Apart from the fact that that part of Lamarck's explanation which is alone worthy of serious consideration constitutes but a small portion of his whole conception, we must remember that even this is a mere *à priori* speculation, and is not supported by a single fact of observation or experiment. Darwin's theory of natural selection, on the other hand, rests secure on the threefold base of the facts of variation, of heredity, and of the struggle for existence. And the method by which these "factors" *must* co-operate to secure the "survival of the fittest" is obvious as soon as it is stated. In other words natural selection is a *vera causa*, and its enemies are obliged to confine themselves to the task of trying to demonstrate that at most it can effect but little in the direction of the transmutation of species.† And in addition to this the results of artificial selection by breeders can be pointed to for the demonstration of what actually has been done by a selective process continued for many generations. But we cannot adduce similar considerations on behalf of the so-called Lamarckian factor. It has never been proved to be a *vera causa*, and for this reason—while the facts of the modification of organs by use and disuse, or by the direct action of the environment during an individual lifetime are perfectly well established, the inheritance of the effects of such modifications are not.

It is true that the adherents of the theory in ques-

* "Zoonomia."

† "Philosophie Zoologique."

‡ "*Deuxième Loi.* Tout ce que la nature a fait acquérir ou perdre aux individus par l'influence des circonstances où leur race se trouve depuis longtemps exposée, et par conséquent par l'influence de l'emploi prédominant de tel organe, ou par celle d'un défaut constant d'usage de telle partie, elle le conserve par la génération aux nouveaux individus qui en proviennent, pourvu que les changements acquis soient communs aux deux sexes ou à ceux qui ont produit ces nouveaux individus."—"Philosophie Zoologique," tome i. p. 235, édition Savy, 1873.

* "Factors of Organic Evolution," pp. 2–3.

† *E.g.*, *vide* Dr. St. G. Mivart, "Nature," December 6th, 1888.

tion—which has until just recently been accepted unhesitatingly—bring forward a mass of indirect evidence in support of their view ; nevertheless, it is quite apparent that so long as direct experimental evidence, about which no doubt can exist, is wanting, this fundamental insecurity must exist. But to this subject we shall return later.

It is hardly necessary to remind any one familiar with Mr. Darwin's works that he considered certain phenomena to be only explicable as the inherited effects of increased use or disuse of particular organs. Many of the phenomena of degeneration, for instance, in a useless organ, he thought were due to the effects of disuse. He expressly states * that the working of this factor is always subordinate to natural selection, and that in some cases its effects are destroyed by the latter ; but there is no doubt, as Mr. Herbert Spencer has shown, † that, as time went on, he attributed increasing importance to this factor ; that he was, in fact, driven slightly from his original position by hostile criticism. Later in life, too, he became convinced that the cumulative direct effect of changed conditions had been important in some cases, especially where partial or complete isolation allowed them to have full effect. In a letter to Professor Wagner in 1876, ‡ he goes so far as to say, "In my opinion the greatest error which I have committed has been not allowing sufficient weight to the direct action of the environment, *i.e.* food, climate, etc., independently of natural selection."

But although Mr. Darwin believed in the transmission by heredity of "acquired modifications," I think it is a mistake to suppose that he derived his belief from Lamarck's teaching. No one doubted, until quite recently, that characters acquired during the life of the individual were hereditary equally with congenital ones. Mr. Darwin found that he could not explain certain phenomena by natural selection, and thought that they were best explicable as the result of increased use or disuse, etc. The explanation formed but a small part of Mr. Darwin's theory, as it had of Lamarck's, but while it was scientifically the strongest portion of the Lamarckian doctrine of evolution, it was the weakest of the Darwinian. We know that Mr. Darwin did not estimate the "Philosophie Zoologique" very highly. Thus he says : "It is curious how largely my grandfather, Dr. Erasmus Darwin, anticipated the views and erroneous grounds of opinion of Lamarck in his 'Zoonomia' (vol. i. pp. 500–510), published in 1794." § Again, he remonstrates with Lyell in 1863 for alluding to his (Darwin's) views as "a modification of Lamarck's doctrine of development and progression," and remarks that "this way of putting the case is very injurious to its acceptance, as it implies necessary progression, and closely connects Wallace's and my views with what I consider, after two deliberate readings, as a wretched book, and one from which (I well remember my surprise) I gained nothing." * In a letter to Hooker he characterises the "Philosophie" as "veritable rubbish," † and finally in October, 1859, just before the publication of the "Origin" we find the following remark as the postscript of a letter to Lyell : "You often allude to Lamarck's work ; I do not know what you think about it, but it appeared to me extremely poor ; I got not a fact or idea from it." ‡ With these very definite and strong statements of Darwin before us we can hardly contend, I think, that he borrowed his views about the inheritance of acquired characters from Lamarck. In his "Historical Sketch," prefixed to the sixth edition of the "Origin," he calls attention to the "eminent service" done by Lamarck in "arousing attention to the probability of all change in the organic world being the result of law ;" (p. xiv.) but there is no word of praise for that part of the French naturalist's theory of evolution which coincides with some of Darwin's own views. I do not think there remains a doubt that the "trace of Lamarckism" often alluded to as remaining in the Darwinian theory, is not Lamarckism at all, except in the sense that Lamarck advocated similar views. As I have said, at the time when the "Origin" was thought out and written, and for a long while afterwards it had never occurred to any one to doubt that acquired characters could be inherited, and it was natural enough for Darwin to use this universally accepted factor to supplement natural selection. We find his nearest approach to dogmatism on this subject : "Changed habits produce an inherited effect, as in the period of the flowering of plants when transported from one climate to another, etc." § The naturalness of such an occurrence being obviously taken for granted, there is in many cases hardly an attempt at proof, and very seldom is the evidence for and against the explanation given worked out and weighed with the minute and painstaking care to which we are accustomed in all Darwin's works.

I have insisted on these considerations because it seems of very considerable importance to ascertain Darwin's exact attitude towards the views in question, how and why he acquired them, and what relation they bore in his mind to the theory of natural selection. And it seems nearly certain that, unlike that great hypothesis, the inheritance of acquired characters was used as an obvious supplemental explanation, and that a doubt of the truth of its fundamental facts never entered Darwin's head. But I deny that Darwin "partially retained the Lamarckian explanation," thereby deliberately adopting any of the speculative "laws" of the

* *Loc. cit.* p. 114, &c.
† "Factors of Organic Evolution," pp. 32–33.
‡ "Life," iii. p. 159.
§ "Origin," 6th edition, Historical Sketch, p. xiv.

* "Life," iii. p. 14.
† Ibid. ii. p. 29.
‡ Ibid. ii. p. 215.
§ "Origin," p. 8.

French naturalist. Mr. Platt Ball, in his little book on the "Effects of Use and Disuse," holds this view, and even remarks that "Darwin's belief in the inheritance of acquired characters was more or less hereditary in the family," instancing his father's and grandfather's views on this point. Unless Mr. Ball is prepared to maintain that there was a special inherent predisposition in the Darwin family towards this belief, he is here assuming the inheritance of an acquired character!

As has been already mentioned, Mr. Darwin attributed more and more importance to this factor in the successive editions of the "Origin," and his opinion on the point culminated in the letter to Professor Wagner already quoted.* It is remarkable too, that he was constrained to form a theory of heredity on the lines of Pangenesis largely to explain these very phenomena. In a letter to Huxley, speaking of his as yet unpublished hypothesis of Pangenesis, he says: "I think some such view will have to be adopted, when I call to mind the inherited effects of use and disuse, etc."† Here Darwin was absolutely right. As we shall point out more fully hereafter when discussing possible theories of heredity, "some such view" must be adopted if we believe that the effects of use and disuse are inherited. The naturalists who refused to accept the main idea of "Pangenesis" were trying to maintain an untenable position while they believed in such inheritance. Neither Darwin nor they, however, perceived the only possible alternative—an alternative which has now been accepted by many—to re-examine the whole grounds of our belief, and boldly declare that definite proof of such inheritance is wanting. This at once casts the *onus probandi* upon our opponents, and exempts us from the astounding exercise of faith required to believe in the mechanism of Pangenesis.

The history of the growth of opinion since 1859 on the subject of the factors of organic evolution is too long a story to be more than touched upon here. But the extreme views which have sprung up on both sides, and the complete chain of connection between them are sufficiently remarkable. On the one hand we have the Neo-Lamarckians; in the main an American school of palæontologists, (of whom Professor Cope is perhaps the best-known member) who reduce the action of natural selection to an almost negligeable minimum, and consider that use and disuse, etc., have been the main agents in the evolution of such structures, for instance, as the mammalian tooth. Professor Eimer in Germany and Mr. Cunningham in England hold somewhat similar views. Then we have a class of biologists like Mr. Patrick Geddes, who believes in natural selection to a certain extent, but rather uses it to supplement various more or less ingenious theories of his own, which appear to him to account for the main facts of evolution better than do Darwin's.

* It is collaterally interesting, however, to note that so late as 1881 Darwin was "staggered" (by Hoffman's experiments on the direct effect of conditions on plants) in his views about the increase of variability, especially in cultivated plants, through such direct effects.—"Life," iii. p. 345.

† Ibid. iii. p. 44.

Next we have Mr. Herbert Spencer (and his followers) who stands in a distinctly different position to any of the foregoing, inasmuch as he believed in evolution before 1859, and therefore certainly does not owe from a speculative point of view so much to Darwin's work as do most other people. Mr. Spencer believes, and always did believe, that all organisms are being directly and profoundly affected from moment to moment by the environment, and that the modifications so brought about cannot fail to be transmitted to their offspring. He believes too, that modifications of function in the individual life effect permanent modifications of function and structure in phylogeny (or life of the species) independently of natural selection. This continual direct attempt, as it were, on the part of an organism to adjust itself to its environment he calls "Direct Equilibration." He accepts the process of natural selection, also, as an important factor, and calls it "Indirect Equilibration," *i.e.*, the indirect process of adjustment to environment, through variation, and the survival of the fittest.

These are the views enunciated in the "Principles of Biology," and quite lately in two articles in the "Nineteenth Century" for 1886* he has emphasised them, and added new arguments and fuller evidence.

Professor Burdon-Sanderson has suggested that those who think such factors as the ones specially worked out by Mr. Spencer to be true factors and of extensive application should be called "Spencerians" rather than Lamarckians, because, as has already been pointed out, such views as these formed but an insignificant portion of the Lamarckian doctrine of evolution, while they have always been insisted on as most important by Mr. Spencer, who has, in addition, expressed them in a more general form and widened their meaning and application. The appellation would certainly serve to distinguish the people in question on the one hand from the extreme Neo-Lamarckians, and on the other from true Darwinians.

Next to the Spencerians we have biologists with views like Professor Romanes, who claim to be the true Darwinians, in holding the position of Darwin's later years. They consider natural selection to be the main factor, but recognise various others as supplementary to it, such as "physiological selection," and the effects of other kinds of segregation, either physiological or geographical, and in some cases recognising to a greater or less extent the Spencerian or Lamarckian factors, or else reserving their judgment on this point. Closely following on these, we have, so far as my experience has gone,

* Reprinted as "The Factors of Organic Evolution."

the main body of working biologists, who do not, perhaps, go so far as the Neo-Darwinians, but whose continually enlarging experience of the wonderful and beautiful adaptations to be found in every nook and cranny of the organic world and constantly coming to light in their studies—anatomical, histological, physiological, or bionomic—makes them firm believers in natural selection, as overwhelmingly the most important cause of evolution, and gives them a reluctance—justifiable or the reverse—to place much confidence in such supplementary factors as those I have mentioned.

Lastly we have the extreme "Neo-Darwinians," as Professor Ray Lankester has called them, whose position may be summarised as follows. They assert:

(1) That the inheritance of any character acquired by an individual during its lifetime has never been experimentally proved: (2) that hence we are not justified in explaining any of the facts of evolution by any process which involves such inheritance: (3) that these facts can be as well or better explained by natural selection and kindred selective processes in conjunction with the effects of training during the individual life-time than by the alleged inheritance of acquired characters, and that hence the indirect evidence for such inheritance can be refuted, and (4) that the *onus probandi* rests, not on them, but on their opponents, who would retain an unproved and unnecessary (though hitherto universally-accepted) factor, in our explanation of evolution.

Professor Weismann, Professor Lankester, Professor Meldola, Mr. Wallace, and Mr. Poulton are examples of some of the more distinguished of the Neo-Darwinians.

In subsequent papers we shall be chiefly occupied in investigating the justification of their views.

THE WHITE FLOWER QUESTION.

By Fred. H. Davey.

It would indeed be passing strange if the interesting correspondence on this subject did not lead to some profitable conclusion. It is one of the branches of botany which has notoriously held the background, notwithstanding the probabilities that it might ultimately throw valuable light on the origin of new varieties, and thus minimise the labours of the large and indefatigable band of biologists who give their whole energies to a solution of the problem. Albinism in the animal kingdom, more particularly in the genus *homo*, has long been an interesting field of labour to scientists, and from all accounts has led to good results, so far as it has been proved albino varieties may at times possess the power of transmitting their peculiarities to their offspring. I don't mean to assert it is an established fact that albinism in the human family is hereditary. But I do say it is now beyond the range of probabilities that in the lower animal creation, at least, albino varieties have begotten progeny with similar tendencies. Why, then, seeing it is of such vital importance, has the subject of white variations in the vegetable kingdom been so monstrously neglected?

I for one must object to the word albinism being used in reference to floral variations which assume a whitish colour. By an albino I understand an animal possessing white feathers, white fur, white hair, or a white skin, with the addition of pink or red eyes. I freely admit in either instance the variation may be the result of similar pathological modifications, but even that hardly warrants a use of the same term in both cases. Were it so, we might with as good reason term the sweat-glands of the human body stomata, or the system of tissues through which nourishment is conveyed to the extremities of a plant the alimentary canal.

One cannot be too cautious in advancing opinions on a subject so wide in its range and fraught with so many difficulties; and of course, not being a practical biologist, I dare not dogmatise in this case. But to myself, as I presume has likewise been the case with a great many readers of Science Gossip, the question naturally suggests itself, "How best to account for these deviations?" Do they occur through a modification of the pigment cells? Is there an intensified oxidation of the chromule? Is there really an absence in the pigment of certain elements essential to the normal colouring? Or are these variations the outcome of a progressive or retrogressive development of colouring-matter? Pertinent questions these, although such as ought to be partly, if not even wholly, met by the more advanced readers of, and contributors to, these columns. Will they come to our rescue? I am daily more and more convinced of the importance of the subject, and am certain many others will with myself feel grateful for any light.

This district is inordinately prolific in the way of white variations. From Bissoe my father has repeatedly brought pure white specimens of *Calluna erica*, *Erica cinerea*, and *E. tetralix*, and a few beautiful white heads of *Centaurea nigra*. From the Lizard I have had huge bunches of *Erica vagans* brought me, embracing every shade from snowy white to deep purple. My father entertains no doubt at all on the plants he has seen producing white flowers year after year. Some of them he has carefully watched for upwards of twenty years without being able to detect the remotest disposition on their part to return to the normal colour. *Erica ciliaris*, on the contrary, never produces in this locality any but the rich pink flowers.

The most peculiar variation coming under my own notice was a low, dwarf-like variety of *Wahlenbergia hederacea*, bearing elegant white flowers, if anything a little more bell-shaped than those of the type-form. The plant cropped up in quantities some five years ago in a small bog close by, and continued to thrive there up to last summer. What struck me as the most remarkable feature of the case, was that the little pigmy grew in a straight line across the moor, at no part spreading more than three or four feet. It was a pretty sight to stand at one end and trace this dainty morsel right across—here just peeping over the trailing pennywort, and there over-topped by the lesser skull-cap—and then to compare it with the more elegant trailing branches and delicate pale-blue flowers of the normal plant which blossomed profusely all round.

In addition to the plants mentioned we have noticed white varieties of *Ranunculus ficaria*, *Aquilegia vulgaris*, *Viola canina*, *Polygala vulgaris*, *Geranium molle*, *Erodium maritimum*, *Sedum anglicum*, *Epilobium montanum*, *Valeriana officinalis*, *Jasione montana*, *Primula vulgaris*, *Polemonium cæruleum*, *Symphytum officinale*, *Myosotis palustris*, *Digitalis purpurea*, *Veronica chamædrys*, *Pedicularis sylvatica*, *Thymus serpyllum*, *Prunella vulgaris*, *Ajuga reptans*.

This list is a very significant one, and, if Grant Allen's theory of progressive colour development goes for aught, argues conclusively a movement on retrogressive lines. It will be noticed that in this list, as well as in the one submitted last month by E. Armitage, only two plants with yellow flowers figure as sporting into white. In his progressive colour-scale, Mr. Allen gives yellow, white, red, purple, lilac, mauve, violet, and blue; white being an improvement on the yellow, red on the white, etc. Our two lists show a remarkable preponderance of blue over the yellow, and of red over the blue, driving one to the conclusion that as red is an improvement on white, and blue is the highest stage of development, white variations from the type indicate a retrogressive rather than a progressive development of colouring-matter.

Of course these are merely a few suggestions. I may be right or wrong in assuming the subject to be of vital importance, or in objecting to the word albinism being used in reference to this subject. I may be equally right or wrong on the progressive or retrogressive colour theory, or in my assumptions on the oxidation of chromule, on the absence or presence of certain elements in the pigment, or in the modification of the pigment cells. Be that as it may, these suggestions may help to focus our attention, and thereby enable us to deal practically with the problem.

Pousanooth, Perran-ar-worthal, Cornwall.

SCIENCE-GOSSIP.

We have received a reprint from "Inventions," giving an account of Mr. James Nelson's ingenious "Calculating Dial," as furnishing a ready means for calculating figures in commercial business.

The celebrated collection of recent shells formed by the late Sir David Barclay, Bart., was sold by auction at Messrs. Stevens' Rooms, London, on the 6th of July and three following days. The catalogue compiled by Mr. Hugh Fulton contained particulars of 1,200 lots, which included a number of extremely rare species, also many type specimens. The following are some of the highest prices realised for single specimens:—*Voluta aulica*, £10; *Murex Barclayi*, £9 10*s.*; *Marginella mirabilis*, £6 10*s.*; *Strombus taurus*, £5 10*s.*; *Conus crocatus*, £5 10*s.*; *Cyclostoma formosa*, £4 10*s.*; *Cypræa bicallosa*, £3; *Scalaria decussata* (two specimens), £4 5*s*.

A deeply thoughtful, and highly interesting address is that of Dr. A. Leifius, delivered before the Royal Society of New South Wales (London: Kegan Paul & Co.).

Dr. J. E. Taylor has just published verbatim the "Story of the Felixstowe Crags", (illustrated), as told by him to a public audience at Felixstowe on Wednesday, July 29 (Ipswich: "East Anglian Daily Times" Office, price sixpence).

The second quarterly number of "The Conchologist" (edited by W. E. Collings) is even better than the first. It cannot fail to prove a welcome guest among all interested in Conchological subjects.

The Report of the Botanical Exchange Club for 1890 (Manchester, Jas. Collins & Co., King St.) is as valuable an accession to our botanical literature as usual. No English botanist should be without it.

The third number of the "Mediterranean Naturalist" demonstrates that a welcome and useful periodical has joined our ranks.

Dr. C. W. Riley's "Report of the Entomologist for 1890," is even more readable and suggestive than is usual with this distinguished entomologist's "Reports."

The "Garner" is now amalgamated with the "Naturalist's Gazette," and both in the new form are published at one penny monthly.

We have received a most interesting and thoughtful brochure, by F. Howard Collins, on "The Diminution of the Jaw in Civilised Races, an Effect of Disuse." Of course, the author refers to eating—not to politics or "social" subjects.

Sir Geo. B. Airy, late Astronomer Royal, is the doyen of British science. He has just entered his ninety-first year, and appears to be as bright and chippy as ever.

After re-consideration the President of the Board of Trade has granted a licence to the British Institute of Preventive Medicine to register the institution as a limited liability company with the omission of the word "limited." The licence, however, is not to be construed as expressing approval by Sir Michael Hicks-Beach of experiments on animals, or in any way affecting the exercise by the Secretary of State of his discretionary powers to grant or withhold a vivisection licence to the proposed institute.

It is proposed to erect an observatory on top of Mont Blanc. The idea originated with M. Janssen, who stayed on the mountain some time last summer for the purpose of making meteorological observations. In conjunction with M. Eiffel (of tower fame), and with the support of M. Bischoffsheim, Prince Roland Bonaparte, and Baron Alfred de Rothschild, he has now elaborated a plan which is as daring as the Jungfrau railway. The observatory is to be entirely of iron, and is to have a length of eighty-five feet and a breadth of twenty feet. The iron roof is to have the spherical form of an ironclad turret, which the construction will much resemble. The erection of such a building on the highest point of Mont Blanc naturally involves thorough preliminary studies, with which a Zürich engineer experienced in works on high mountains has been charged by M. Eiffel and M. Janssen.

We deeply regret having to record the death of Mr. D. Mackintosh, F.G.S., whose work on "The Scenery of England and Wales," is well known. It was a pioneer work on the subject, although it ascribed everything to marine denudation. Mr. Mackintosh was also well known as a geological lecturer.

"Technical Education" is all in the air. The official people discussing it remind us of the Little Room at Jerusalem.

A new Flux for iron has been brought out under the name of *Stephanite.* It includes aluminum with the iron in a chemical combination, and is said to render the iron harder than the hardest steel.

M. Boutoux has found there are five species of plant fungi, and three of bacteria present during the fermentation of bread. The bacteria operate on the gluten.

We are sorry to record the death of an early contributor to our columns, that of the genial naturalist Dr. Thos. Allcock of Manchester, in his sixty-ninth year.

MICROSCOPY.

New Slides.—Mr. Abraham Flatters, of Openshaw, Manchester, sends us four botanical slides, which for clean-cut sections and definite staining and good mounting are among the best we have examined. All botanical students are aware that a well-mounted section of the organs of plants is worth a thousand pictures of the same, as regards their power of impression. Mr. Flatter's slides are as follows: section of the ovary of *Lilium croceum*, 2-inch object; leaf-bud of ash (*Fraxinus excelsior*), 2-inch object, and spot; trans-section of leaf-bud of sycamore (*Acer pseudoplatanus*), 2-inch object; trans-section of ovary of *Iris Germanica*, 2-inch object. Mr. Flatters is a working man—one of the ardent and enthusiastic working-men naturalists for which Lancashire has always been famous. We hope, therefore, the fact of our calling attention to his capital slides will be a source of encouragement.

ZOOLOGY.

A Link with the Trilobites.—Four or five sea scorpions have recently been placed in two of the tanks in the fish-house at the Zoological Gardens. The creature is better known as King Crab (*Limulus*), but the first name is more appropriate. It is really a marine representation of the scorpions in the insect-house, and is not a crab at all; but unlike them it cannot sting, although the long spine in which its body terminates is the precise equivalent of the venomous sting of the scorpion. If the sea scorpions find their surroundings sufficiently congenial, they may, perhaps, lay eggs and hatch out young. This would be a very desirable event, for the young of this animal are curiously like some of the extinct Trilobites.

BOTANY.

The Tii Plant of Tahiti.—In an interesting work entitled "Tahiti, the Garden of the Pacific," by Dora Hort, published by T. Fisher Unwin, there appears the following account of some peculiar properties of the above plant. Perhaps some of the readers of Science-Gossip may be able to furnish a satisfactory explanation of the power possessed by this plant in deadening the heat emitted from fire.

"The leaf of the Tii possesses the mysterious power of quelling the heat usually emitted from flames of fire. At an early period of Tahitian history this property was only known to the idolatrous priests, who made use of their knowledge to assist in the performance of miracles which would not bear too close scrutiny. Standing by the *marais*, they held branches of the Tii plants, which rendered them imperviable to the fiery tongue of flame by which they were surrounded. Captain Blackett related to me a ceremony he had witnessed some years previously at one of the Leeward Islands. A procession of natives bearing branches of the plant in question, waved them from side to side as they walked with bare feet and legs over red-hot stones, and through fiery flames without any injury whatever to their naked limbs. Captain Blackett, after having watched their mode of proceeding, was convinced that waving the branches they carried counteracted in some way the effect of the heat, which he undertook to test in his own person. Divesting himself of shoes and stockings, he tucked up his trousers, and imitating the others with regard to the Tii plant, he passed in a similar manner through the fire without experiencing the slightest inconvenience from the flames, which he said played about his bare legs."—*J. F. Cranswick.*

MERCURIALIS PERENNIS.—At page 179 of SCIENCE-GOSSIP for the present month, *Mercurialis perennis* is written of as "sometimes eaten as a vegetable," surely this is a mistake, the plant is very poisonous, and it is well to caution your readers against eating it; the plant eaten as spinach is the Mercury Goose-Foot, *Chenopodium Bonus Henricus*, belonging to the order Chenopodiaceæ, which contains many edible species, as orach, spinach, and beet.—*J. Jenner Weir.*

ABNORMAL SCABIOUS.—I enclose a specimen of scabious herewith, as it has none of the usual compressed central florets on its disk. It may be useful as an example of defective development.—*R. Ashington Bullen.*

VAR. OF LILIUM AURATUM.—Amongst a large number of flowers of *Lilium auratum* last year, I saw one which struck me as being rather peculiar; instead of the stigmas and styles being united in their whole length, there was one style with its stigma distinctly separate, and the other two had their styles separate but were united by their stigmas. Is such a case, may I ask, of rare occurrence? I preserved the specimen in spirit. While writing this may I ask what is the best book for a beginner on the study of worms (Vermes)?—*Eldon Pratt.*

ARCHÆOLOGY AND PLANT TRADITIONS.—In an address given during an excursion of the Essex Field Club on August 8, Dr. J. E. Taylor made some remarks, to which we invite the attention of archæological botanists. Speaking of their folklore, he said that many of the traditions concerning them were the common property of Norwegian, Danish, German, French, English, Spanish, Russian, Hungarian, and other countries, and he expressed his belief that these traditions were of Aryan origin, *older* even than the evolution of European languages, and that they were possibly distributed all over Europe during the great Aryan emigration. In this way he connected the popular names and folklore of common plants with ethnological history.

NOTES AND QUERIES.

ROMANO-BRITISH CAMPS.—At a meeting of the Bournemouth Natural History Society at Badbury Rings, near Wimborne, on June 27th, 1891, Dr. Crespi, of Wimborne, said the whole neighbourhood was deeply interesting to the antiquary; Badbury, the Castle Hill at Cranborne, and Dudsbury were a few of the most interesting. Several questions of importance would call for brief enquiry. These were: Who constructed these camps? why were they formed? and what was the condition of the country at the time? Badbury was puzzling. The Rings consist of three bold and almost perfect embankments and three ditches; they are circular, cover eighteen acres, and have two entrances, facing respectively east and west. The innermost ring is often said to be Keltic, the middle Roman, and the external Saxon or Anglo-Saxon; the extreme circumference is 1,738 yards. Of the history of Badbury nothing is really known except that, according to the "Saxon Chronicle" of A.D. 901, the year of Alfred's death, his son and successor, Edward the Elder, held it, while his kinsman and rival Ethelwald was posted at Wimborne. Ethelwald, after stating that he would either live or die at Wimborne, stole off by night to join the Danes and Mercians in Northumbria. There is no evidence that Badbury was the Mons Badonicus of the early chroniclers. Few remains of interest have been found at or near Badbury itself, with the exception of some coins—one, however, a beautiful gold one, pieces of pottery, three swords, and a few bones. The objection to Badbury, or rather the middle ring, being a Roman encampment is that the Romans usually constructed nearly square camps, with four entrances, one in the middle of each of the four faces; but it did not follow that the Romans might not have occupied Badbury for a time, utilising the fortifications which they found here. To leave Badbury and give a glance at other equally huge earthworks in the neighbourhood of Wimborne, their enormous size and the vast labour implied in throwing them up, must not be overlooked. One could not avoid the conclusion that the population of the district must have been very large, not that of the whole country, a widely different matter, but that of the districts in which the camps are formed. General Pitt Rivers agrees in this opinion, and believes that in an age when much of the land was swampy, or covered with dense and almost impenetrable primæval forests, dry downs would offer great attractions of residence, and that the inhabitants would need only to protect exposed parts, the forests or the rivers and swamps sufficiently defending the other sides. Some light, Dr. Crespi concluded, was thrown on the inhabitants of the region by the discoveries made by General Pitt Rivers; most of the skeletons recently exhumed at Rotherly being exceedingly small, the males averaging 5ft. 1·5in., the females 4ft. 9in., while the Anglo-Saxon skeletons at Winkelbury average for males 5ft. 6·9 in., and the females 5ft. 2·3 in. Some bronze age skeletons found by General Pitt Rivers were of greater stature than the Anglo-Saxon ones at Winkelbury. The almost entire absence of round-headedness showed that a Roman strain was rare among the people of the district. To sum up, so little is at present known of the conditions of life and of the people of the region, where most of the huge camps, which give such interest to the district, were constructed, that it is necessary to speak with very great reserve, so that there is still the widest possible latitude for the imagination. It is consequently not astonishing that the highest authorities do not agree. One thing is clear, that many of these immense fortifications were thrown up after the departure of the Romans, and the proof of this important fact is that vast numbers of Roman coins are found in the embankments often many feet below the top of them, so that they must have been thrown up with the earth with which the fortifications are made; others may be far more ancient than Roman times. Future explorations may lead to important discoveries, particularly at Badbury, which has in great measure escaped the researches of Archæologists.

Squirrels in Winter.—To doubt that the squirrel hibernates, because it is not infrequently seen abroad in the winter, appears to me rather like questioning whether bats are strictly nocturnal, on the strength of the few notes recently inserted in Science-Gossip relative to their flying in sunlight. This last occurrence, by the way, is far more common than any of the correspondents who have sent their observations, seem to suppose. I believe no summer passes without my seeing instances of it. At times, a bat will be noticed for several successive days, hawking round the same spot in the brightest hours of sunshine. As to the squirrel, I am well aware that he may be seen in every month of the year; but the marked absence of regularlity in his winter appearances can only, I think, be explained by still considering him to a certain extent a hibernant. In a wooded country frequented by squirrels, a person who has observed their habits can visit them any day he pleases throughout the summer months, with little fear of failing to find them at home. The litter which a squirrel makes under the tree wherein his daily meal is despatched is quite prodigious; so that even a casual walk through the grove tells you in what trees squirrels have been recently feeding; and where the fragments are freshest, a squirrel will be found. But of course you must go at his meal-time. The hour of his afternoon repast is from 3.30 to 4.30, and during that period the squirrel's acquaintance can be cultivated *ad libitum*. Day after day you will find him in the same tree—a larch if it be August, a beech if it be September—crunching the cones of the one or the mast of the other, and pelting the fragments down upon you as you sprawl on the sward beneath. I have spent many a pleasant half-hour in receipt of these attentions. In winter, you come across the squirrel by chance, or stumble upon traces of a squirrel feast (under Scotch firs generally) fresh enough to inform you that a squirrel has been there not longer ago than yesterday afternoon. But go to the spot to-morrow, and you will find the very same patch of fragments, only less fresh; not in the least augmented by further chippings. Or go where you met the squirrel himself, and if you expect to meet him again you are more than likely to be disappointed. Why, then, cannot the squirrel be traced in winter as well as in summer? I think we may answer, because the squirrel only occasionally wakes up to life in the winter, and the fact that he has dined once in such or such a tree is no indication of a likelihood of his returning thereto. Yet I am far from questioning that these frequent interruptions of the squirrel's torpidity may indicate a gradual dying out of the hibernatory habit. If I may speak from the local conditions of my own neighbourhood, where squirrels for the past twelvemonth have been somewhat common (result of some spontaneous migration) no animal could have less need to hibernate. Abundance of food surrounds him at all seasons. Indeed, it is worth mentioning that at least one favourite squirrel-food, the larch-cone, is never out of season. I can give a curious proof of this. During the latter part of last August, 1890, all the squirrels about here seemed to be feeding exclusively on the green larch-cones. It is now August 5th, and the squirrels are nearly all feeding on the old brown larch-cones, remnants of the same crop that afforded them food a year ago. This is not because the green cones are not ready; for as long ago as July 12, the squirrels about Bray, Co. Wicklow, were devouring the green larch-cones, and the cones here are as forward as those at Bray. It is therefore plain that one crop of larch-cones continues to be good feeding for more than a whole year. The squirrel, of course, will at frequent seasons desert the larches for other forms of food; during the whole of September, and greater part of October he seems to subsist entirely on beech-mast; in winter he loves haws and pine-cones, in spring the tender shoots of the spruce. But, whenever he is hard up, he has an unfailing friend in the larch; and therefore, if the squirrels in this part of Ireland have need to hibernate, it is from some different cause than that usually assigned, the scarcity of food.—*C. B. Moffat, Ballyhyland, Co. Wexford.*

Grapes in the Open Air.—F. Y. wishes to ask the scientific reason for exposing hot-house grapes to the night air, for the purpose of colouring them.

Conchological Society's Journal.—As a member of the Conchological Society, may I venture to suggest that the numbers are much damaged for neat binding by the quantity of glue which is used on the backs; they are pinned as well, and in most cases the pins would be sufficient, and ensure neat binding afterwards. I bind my own magazines (as an amateur), therefore I speak practically on the subject.—*Mary Heitland.*

Optical Effect.—The "black branched object which has been popularly likened to the ramifications of the brain" is known as the "figure of Purkinje." Besides being produced in the manner described by H. J. I., the phenomena may be quite as easily noticed by bringing a slight pressure to bear on the eyeball. It is purely a mechanical effect, and is easily explained. Rays of light falling on the eye impinge on the anterior part of the retina, pierce the layer of ramifying fibres of the optic nerve, and the whole strata of the retina, and then act on the bacillary layer, which is composed of minute structures termed rods and cones. In the experiment described by H. J. I., the vision becomes yellowish-red, and is peculiarly marked by dark ramifications which really indicate the branches of the retinal artery. The eye, it will be noticed is directed to the darkest part of the room, while the candle is so held that the light falls on the retina at a slanting angle. This shows up the "branched object," which is none other than the ramifying blood-vessels intervening between the rays of light, and the bacillary or sensitive layer behind. The experiment depends entirely for its success on a slow movement of the candle. This stopped, the figures disappear.—*Fred. H. Davey.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

C. Pither.—Soak the furniture well with common petroleum. The objects are undoubtedly eggs of some species of mite. Sopping with petroleum is the most likely thing we know to get rid of them. We shall be glad to hear if any of our readers know of anything more insecticidal.

H. L. T.—Science-Gossip has a large circulation outside the United Kingdom—larger than that of any other scientific journal.

A. Flatters.—We have received your two excellent mounts of transverse sections of *Lilium croceum*, and leaf-bud of ash. Both are very instructive specimens.

John Cookson.—"The Naturalist's Gazette" was published by Mr. Allen, 4 Ave Maria Lane, E.C., subs. 1*d.* monthly. It is now united with "The Garner."

R. M. W.—The worms are not the young of the common earth-worm, but of the species known as "brandlings."

H. G. Sadler. — Dr. Aveling's book will help you. Messer's "New Method of Diagnosis" (Allen & Co., Waterloo Place) will help you more.

K. A. D.—We shall be pleased to have your paper.

A Subscriber.—By some means your flower was not enclosed. We have waited, thinking it had been inadvertently left out. The best means of verifying grasses and sedges would be to consult a herbarium at some museum; or, failing that, Sowerby's "Botany," at some free reference library.

Rev. B. Whitelock and D. H. S. Stewart.—We are much obliged for the abnormal examples of *Geum* and *Salix alba* sent. They are very suggestive objects.

G. E. M.—We frequently get applications for another "General Index" of Science-Gossip, since the last issued in 1876. The expense, however, is too great unless we were guaranteed a number. Although we are aware there is no Cyclopædia of Natural History in the world equal to the twenty-five volumes of Science-Gossip, all purchasers do not bind the volumes, and therefore a "General Index" hangs.

H. E. Griset.—Stark's "British Mosses" (coloured plates), price 7*s.* 6*d.*, and Dr. M. C. Cooke's "British Fungi" (coloured plates), price 6*s.*

R. Coupar.—Apply to Messrs. Macmillan for Professor Marshall-Ward's book on the "Diseases of Timber." It is published, we believe, in the "Nature Series," price 2*s.* 6*d.*

EXCHANGES.

Wright's "Animal Life," Woodward's "Geology of England and Wales," Lyell's "Student's Geology," Mantell's "Excursions," offered in exchange for silver coins, &c.—W. J. Weston, Beckley, Sussex.

Wanted, unmounted material, diatoms, forams, polycistines, &c., in exchange for choice micro-slides of every description. Foreign correspondence solicited.—Suter, 5 Highweek Road, Tottenham, Middlesex.

Offered, South African bird-skins of any order, in fine condition, correctly named and with data, in exchange for named bird-skins of any country but South Africa.—J. G. Brown, North End, Port Elizabeth, South Africa.

Offered, *Prosopeas holosericum, Opeas clavulinum, Buliminus glandulus, B. tenuiliratus, B. camarotus, Clausilia corticina, Pupina compacta, Lagodiscus ciliferum, L. trochulus, Cyclophorus Zollingeri, Opistophorus corniculum, Cyclotus opalinus, Leptopoma ostrea, Amphidromus furcillatus*, from Java, in exchange for foreign helices, &c.—G. K. Gude, 5 Giesbach Road, Upper Holloway, N.

Natural history specimens. Numerous herbarium specimens of rare British alpine flowering plants, mosses, ferns, lichens, marine algæ, &c., or land and freshwater shells and other natural history specimens for exchange. Further particulars sent to any one willing to exchange foreign land shells for the afore-mentioned.—T. Rogers, M.C.S., 27 Oldham Road, Manchester.

British and European lepidoptera wanted, especially noctual. Will give in exchange fine and large North American butterflies and moths.—Chas. S. Westcott, box 167, Merchantville, N.J., Camden Co., U.S.A.

Wanted, fossils from the Stonesfield slate, Lower Oolite, especially echini and cidaris. Offered, fossils from Gault, Thanet sands, &c.—Fredk. Stanley, M.C.S., Margate.

Wanted, living specimens of dragonflies, larvæ, ova, &c.; also parts of insects, wings, &c. State what required in exchange to—H. D. G., 16 Wandle Road, Croydon, Surrey.

A member of the Conchological Society wishes to correspond with collectors residing abroad. Good series of duplicates, including many North-West American. Lists exchanged.—H. L., 270 Uttoxeter Road, Derby.

Offered, Science-Gossip for 1887–91, to date, unbound, clean, "Tales of the Wars," Tacitus "Annals," "Anecdotes of Napoleon,' Bret Harte's "Poems," O. W. Holmes' "Poems," "Alton Locke," "Hypatia," "Dombey and Son," "Vanity Fair," "Old Mortality," "Tom Brown's Schooldays," "Chambers' Miscellany," and others. Wanted, British eggs or butterflies. Send lists to—Hollis, Manthorpe Road, Grantham.

Offered, fine specimens of *Donax scortum*, from Burma. What offers in British shells, or others?—Mrs. Heitland, The Priory, Shrewsbury.

Botanical slides wanted, mounted sections, &c., useful for class work. A packet of good unmounted material from New Zealand will be given in exchange for each slide.—W. A. Gain, Tuxford, Newark.

Wanted, foreign stamps in exchange for minerals, fossils, shells, and botanical objects, &c.—F. Cartwright, 20 Eldon Street, C.-on-M., Manchester.

Wanted, side-blown eggs—skylark, tits, rooks, hawks, warblers, and many others, in exchange for rare species, some in clutches with nests, and with data.—I. Ellison, Steckton, Keoghley.

Offered, "Northern Microscopist," eighteen numbers, July 1882, to December 1883; also "Selborne Magazine," first eighteen numbers, January 1888, to June 1889, all perfect and clean as published. Wanted, other scientific books, or good micro. material, or slides.—Amos, 17 Alfred Street, Bath.

Can offer rare British shells in return for coal ferns, good rock and diatom mounts, rare stamps, stamp album, or books on natural history, in good condition.—T. E. Sclater, Bank Street, Teignmouth, Devonshire.

Will give 150 polished geological cabinet specimens of Devonian corals and sponges, valued from 1*s.* and upwards, for a good microscope, with its appliances. Will also exchange similar specimens for opera-glass, or a secondhand old-fashioned watch that will keep time.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

Will exchange the following sets of eggs for others not in collection: two sets missel thrush, each containing four eggs; two sets kestrels, four and five eggs; two sets common sandpipers, four eggs; and three eggs of common gull.—J. Hume, 34 Burdon Terrace, Newcastle-on-Tyne.

Wanted, offers for a few Canadian silurian fossils, as well as some English from chalk, flint, &c.; also Nicholson's "Palæontology," Mantell's "Wonders of Geology," and Woodward's "Mollusca."—J. A. Floyd, 5 Hospital Road, Bury-St.-Edmunds.

What offers for a number of text and guide-books for the London University Matriculation Examination. List sent.—H. P., 103 Camden Street, London, N.W.

Glazed mahogany insect cabinet, eight drawers, quite new, cost 50*s.* Will exchange to value for British birds' eggs, especially sea birds; clutches preferred.—W. H. Killick, Eastbourne, Midhurst.

Wanted, glass-topped boxes, round or square, suitable for mounting fragile and small shells.—Thomas W. Reader, 171 Hemingford Road, Barnsbury, London, N.

Duplicates.—Suspecta, loniceræ (bred), ulmata, arcuosa; also fine varieties of guillemot eggs. Desiderata: eggs, shells, and insects.—W. Hewett, 12 Howard Street, York.

Wanted, perfect specimens of mole-crickets, field-crickets, and wood-crickets, also blatta and British-caught locusts. Duplicates numerous, including *P. viridissima, P. brachypterus, L. biguttatus, Sympetrum vulgatum, P. machaon, L. sinapis, L. rhamni, A. adippe, paphia, Selene euphrosyne, S. semele, C. typhon, N. lucina, E. Jacobæa, V. atalanta, V. io, V. cardui*, &c.—W. Harcourt Bath, Ladywood, Birmingham.

Offered, accumulation of dried plants, including *Thalict. saxat., Seseli liban., Drosera angl., Clæl. marisc., Monstr. hypo., Aspid. thelyp.*, &c. Wanted, Science-Gossip for 1888, 1890, and 1891, books, or offers for whole lot.—G. H. Bryan, Thornlea, Cambridge.

I shall be pleased to communicate with anyone interested in conchology.—G. E. Leville, Cross Bank, Waterhead, Oldham.

BOOKS, ETC., RECEIVED FOR NOTICE.

"The Right Hand: Left-Handedness," by Sir Daniel Wilson (London: Macmillan).—"The Telescope," by Joseph W. Williams (London: Swan Sonnenschein & Co.).—"The Microscope."—"The American Monthly Micro. Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Essex Naturalist."—"The Garner and Naturalist's Gazette."—"Feuille des Jeunes Naturalistes."—"Mediterranean Naturalist."—"Journal of Microscopy," &c., &c.

Communications received up to the 12th ult. from: R. C. P.—A. B.—J. W.—H. D. G.—W. J. W.—T. W. S.—W. T. L.—F. G. K.—E. P.—C. S. H.—T. R.—E. K. G.—H. D.—U. J. W.—F. S.—A. F.—W. H. B.—T. E. L.—H. W. P.—C. N.—J. M. N. C.—J. H.—J. A. F.—W. H. M. K.—T. W. R.—M. E. P.—A. V.—D. K.—H. L. T.—J. H. G.—W. H.—M. B. W.—A. S. T.—J. W. H.—S. L. M.—J. A.—C. P. G.—M. B. M.—J. W. P.—R. G. M.—M. D.—J. J. W.—A. V.—C. M. B.—J. H. G.—J. E.—F. C.—W. A. G.—M. H.—F. H. D.—C. D. R.—H. L. T.—A. H.—J. F. C.—W. W.—R. A. B.—T. E. S.—A. J. R. S.—&c., &c.

NOTES FOR WINTER WORK.

Some Aspects of Scientific Association.

MEMBERSHIP of a society established for the purpose of promoting research and diffusing knowledge in some branch of science, possesses so many advantages that one is apt to overlook the obligations imposed by it, as well as the special character of the benefits to be derived from it. It is useful from time to time to revert to the consideration of these; and if in the remarks which follow there is nothing strikingly novel, or eminently sensational, I would venture to remind my readers of a statement to be found somewhere in Hannah Moore's works, to the effect that though the office of a reminder is more humble than that of an instructor, it is often quite as necessary.

One of the first things we are prone to overlook is that our rights, as members of a society, are indissolubly linked to certain definite obligations. In this respect we do not differ from the general body of mankind. All men insist more strenuously on the maintenance of their rights, or what they take to be their rights, than they do on the observance of the obligations which those rights inevitably imply. Take the simple instance of the right to speak freely in support of any particular view; it carries with it the obligation to be deferential, and observant of that degree of courtesy which is perfectly consistent with the most zealous advocacy of our opinions. I write with special reference to the smaller natural history and microscopical societies, and field-clubs which do so much good wherever they are established. It is not unusual in such associations to hear the complaint made by some of the more critical members that subjects are brought forward without due regard to the attainments and proficiency of the general body of subscribers; or, as I myself have heard it expressed, that science is made to put on "too much side." It is undoubtedly the right of members to claim that matters shall be put before them in such a way as will be best calculated to benefit the majority; that is, in interesting language, and in terms which the majority may comprehend. It is only in this way that societies can be kept together, and science be made even more popular than it is already. But the right indicated runs in double harness, so to speak, with a distinct, but often disregarded obligation. It is assuredly the duty of those who attend the meetings of scientific societies to bring with them a certain amount of preparedness, and beforehand to familiarise themselves with points which are likely to be discussed; or, where this cannot be done for want of books or for other reasons, to consult a friend who may be able to render the required aid. No scientific society can be reasonably required to supplement the want of all preparation on the part of its members.

Closely related to the matters just considered is the suggestion sometimes made that simplicity of subjects rather than of phraseology is needed, meaning thereby that elementary objects and methods should be more frequently dealt with. Now this is a point on which there is ample room for opinions to differ; but without entering into any lengthy discussion of these, it is obviously the duty of every member of a society to educate himself up to the level of his fellow-members. Half the pleasure and the profit of taking up with a hobby and joining a society, lie in the fact that one has mainly to educate himself, and thereby to undergo a certain amount of self-imposed discipline. It is not felt to be a discipline at all, because it is the spontaneous answer of our whole being to an appeal from its better and higher side; but it none the less serves to develop, exercise, and instruct, by methods more or less systematic, the faculties which we possess. To that extent, at least, it is a discipline, and has its moral aspects.

Again, at the bottom of these suggestions to simplify phraseology, and to deal with elementary subjects, there often lurks a fundamental misconception as to the function of education. Every system of education—whether it prevail in schools set apart for pupils of tender years, or in those societies with which we associate ourselves, and which are the schools of our later life—must communicate some information in the form of facts and figures; but is it not the highest function of any such system to put us in the way of getting facts for ourselves, and of arranging, methodising, and utilising them? Looked at from this point of view, it seems difficult to overrate the good which scientific societies are capable of doing. It will be for some future historian to estimate the influence which has been, and is being thus exercised in making our age what it is. Meanwhile, before we venture to criticise the work of any society, would it not be prudent to ascertain whether or not it is discharging the higher rather than the lower function of education?

Reference was made a few lines above to the moral aspects of membership. Though to dilate on the theme would be to exceed the limits we have set ourselves, this phase of our subject cannot be overlooked. A simple instance, one which may be within the experience of some who read this paper, will suffice. You are an enthusiastic member of the microscopical society of the town in which you reside. You have just purchased, or a friend has lent you, one of Möller's splendid type slides; and you take it down to the next meeting with your microscope and lamp. You carefully arrange everything, and have at last secured that degree of light in which the skilled diatomist loves to exhibit his favourites; when another member, who is to read a paper, asks you to lend him your lamp for the evening, as he has forgotten to bring one. He is the "foolish virgin" of the assembly, and his thoughtlessness, it may even be his habitual carelessness, obliges him to impose on your goodnature. Unless you act as the "wise virgins" of the parable did, your evening seems likely to be spoiled in order that your rosy-gilled acquaintance should not lose the *éclat* of the meeting. Common courtesy, however, prompts you to lend your lamp cheerfully. And it is chiefly out of our little unremembered acts of charity and goodwill that the best side of our complex human nature is built up. Membership of a society constantly demands self-sacrifice in a thousand ways. It does so when it requires you to give up some engagement to attend a meeting, to hear a paper read on a subject in which perhaps you do not take a deep interest, but which you know has cost its writer much self-imposed time and trouble. You do not like to read your own papers to empty chairs; your sympathy is thus aroused, and you act rightly in giving up your other engagement for your meeting. Whether in or outside of societies, the benefit to be derived by one's self is obviously by no means the highest motive for well-doing; but in considering the moral results which flow from the loyal observance of the duties incidental to membership, we cannot in the present connection disregard their effects in the direction of developing sympathy.

It sometimes seems to me that our scientific societies may in certain respects discharge for their members some of the functions which were fulfilled by religious orders in the past. Those who in olden times donned the cowl and garb of the monks, derived good, depend on it, from the self-restraint they must have had to exercise again and again, when they found themselves associated with companions not of their own choice, and whose characters may in many instances have seemed utterly unlovable. I think it is Thomas à Kempis who suggests something about the discipline which was thus imposed on one who entered an order. The morning has widened; our day is brighter than his was; our comrades are mainly of our own choice; the scope and aims of the societies we join, and are now gossiping about, differ widely from those which were assembled in the old abbeys; but, thank God, we are still human beings, and not the least good derivable from our scientific societies is to be found in the courtesy which we are required to exercise, and in the self-restraint and self-sacrifice which it often involves. If we thus learn something about others, we should surely in such a position learn still more about ourselves.

W. J. SIMMONS.

Calcutta.

NATURAL HISTORY NOTES.

[*Continued from p.* 203.]

NATURE AROUND A COVERT.

THE particular spot which I shall dwell upon in this paper, is a covert, or preserve for foxes. It is distant from the village in which I write this, about a mile and a half. In the winter-time this spot is the frequent resort of the nearest pack of foxhounds; otherwise the place is hardly ever frequented by any footsteps save those of the keeper, who sometimes visits it in the course of his rounds. The covert (at the east and north sides) is situated close to the road, which, however, is not much frequented by either people on foot, or in carts, so nature is left much to herself during the greater part of the year; though the place in winter-time sometimes resounds with the blows of the axe or bill of the woodcutters, who come to cut up a portion of the oldest wood at times. This covert, which is called "Christmas Gorse," is probably over twenty acres in extent, which is for the most part covered with blackthorn, and large hawthorn bushes, brambles, furze and young oaks, while fir-trees are planted near the outsides, and in other places of the covert. For the observation of wild bird-life, the place is unrivalled any where for miles around.

Situated in the covert is a large roosting-place for starlings, which come trooping into the place every evening by thousands, and returning back in the morning to their accustomed feeding-grounds. It is an interesting sight to watch them coming in to roost. From all directions for miles around the starlings keep coming in every minute by hundreds and thousands, and each flock as it comes in wheels and hovers over the place selected and then darts down and settles for the night.

The air above the roost presents a very animated appearance, hundreds settling down every minute, and thousands coming in to take their place, while those that are settled make a loud chattering noise, which is kept up till dark, and can be heard a long way off. The noise of those that are settled is like a high wind in the tops of the trees, and when they rise suddenly, it is like the noise of distant thunder. These birds crowd together so thickly that they appear to be on top of one another, and the tall blackthorns and hawthorns are in some places completely bent and broken to the ground by their weight. Thousands, if not millions make it their nightly roosting-place.

Occasionally there is to be observed among this mass of birds which frequent this place, an individual with a snowy-white plumage.

The time of the coming in of these birds at night, and the going out in the morning is regulated according to the season of the year. In the depth of winter they begin to arrive at the covert about half past three, and sometimes earlier in the afternoon, going out in the morning about eight. They do not come out in the same way as they go in, *i.e.*, in large compact masses, but are scattered out over the country in long straggling lines.

It is also very interesting to watch the numerous flocks which pass over this village, in the afternoon or evening, as they are on their way to roost. The smaller companies sometimes settle in some tree, where they exert their voices, and create a very pleasing and lively appearance in the surroundings. They wait till some larger flight of starlings appears, which settles for a moment to receive the contingent, and then with a loud whirring of wings and the execution of various manœuvres, they betake themselves off in the direction of their roosting-place, though probably they are recruited on their way by several small companies of their species. As these birds go over sometimes in large flocks containing many thousands, and reaching a quarter of a mile or more in length, we may suppose that these vast flocks are collected by the smaller parties continually joining them from the surrounding feeding-grounds for a great distance around, as they go homewards. These birds frequent the fields in small companies during the day, though several parties often unite together, but they generally soon separate and go off again in various directions.

Occasionally in wandering near their roost we may pick up a dead starling or two with fine glossy plumage, while many pairs of wings and skeletons hang about in the tall blackthorns, and the numerous small heaps of feathers on the ground plainly show that many of these birds are killed by the numerous birds of prey which frequent the place. Hawks and tawny owls haunt the covert, and breed around. Magpies are very common here and may be seen in spring in small numbers of about six together, and once I counted twenty-two as they flew from a meadow into the covert. They build and breed abundantly in the tall hawthorn and blackthorn bushes, in the more inaccessible parts. Pheasants and partridges abound and build among the long grass. Ring-doves breed in the fir-trees abundantly in April and May, and are so common around here, that large flocks of twenty, thirty, or sixty, and even more may be seen early in the year, flying or feeding in the meadows around. The lapwings breed unmolested in the damp meadows near at hand, where their curious flight can be seen and familiar cry heard. Blackbirds and thrushes sing without hindrance from morning till night; and the beautiful jay makes its home here and breeds in the fir-trees. The smaller kinds of wild birds, the crested wren, willow wren, coletit, tomtit, great-tit, white-throat, nightingale, and several others, live and breed undisturbed in this secluded spot.

In April and May, the soft cooing of the ring-doves, and the soft tremulous cooing of the turtle-doves, sounds sweetly from the fir-trees. The nightingale, our sweetest songster, may be heard pouring forth its thrilling notes in the daytime and in the evening, when the other denizens of the air and woods have retired to rest. From without the covert, the sweet voice of the cuckoo and the loud ringing cry of the green woodpecker can be heard.

In spring and summer, the covert is clothed in floral beauty. Snowdrops may be gathered here in early spring, and later on the flowers of the tormentil, dog-violet, and forget-me-not cover the ground in the open places. Large bunches of furze give quite an attraction to the place with their bright golden flowers. The blackthorn bushes show quite white at a distance, and contrast beautifully with the bright and fresh green leaves on the hawthorn bushes which are scattered promiscuously here and there. The beautiful flowers of the wild columbine grow at the top of the covert near the road. The common broom also grows abundantly in a spinny close at hand.

The meadows around are decked in spring and summer with cowslips, primrose, scabious, sneeze-wort, yarrow, lesser stitchwort, early purple orchis, wood anemones, common meadow-sweet, water-dropwort, common burnet, lady-smock, and others.

The footpath to the covert leads through meadows with waving grass, decked with beautiful but common wild-flowers; ragged robins are scattered here and there in the tall grass, with white oxeyes, and large patches of yellow bedstraw, purple vetch, and bird's-foot trefoil growing near together, mixed with yellow rattles, hawkweeds, red and white clover, with others nearly hidden from sight in the long grass. The large waving flowers of the yellow iris, marsh-marigold, water-speedwell, water-forget-me-not, water-figwort, wild columbine, rock-rose, and willow-herbs, etc., grow along the brook which runs just by the covert.

Many of the trees by the brook-side bear the marks of the woodpecker's strong bill, where it lays its eggs, and the tree-sparrow builds its nest in one of the holes made by the woodpecker. Furze-chats also build their nests on the ground at the bottom of furze bushes, in the meadows around, and the black-headed bunting, sedge-warbler, and long-tailed tit, live and breed along this brook undisturbed.

RARE BIRDS SEEN OR SHOT IN THE NEIGHBOURHOOD OF NORTH MARSTON, BUCKS.

A few years ago, a red-legged partridge was seen on Quainton Hills by Mr. John Anstiss, who (I believe) almost stepped on it when it was on its nest. In the summer of 1889 a bird about the size of a blackbird, and somewhat resembling it in form was killed in the grass, in the field close to the moat at Hogshaw. It was of the colour of a young starling on the head, back, wings, and tail, while under the chin and throat, it was of a whitish colour. Mr. John Hughes, the owner of the field, said it must be an uncommon bird, for he had not seen one like it before. I am convinced that it was a female ring-ousel, but as I did not examine it myself I could not be sure at the time. Perhaps some reader might have an idea what the bird just described was.

On July 27th, 1889, I saw sitting on a rail, a curious-looking bird, which on my getting nearer to it, proved to be a hawfinch or grosbeak. I got within a few yards of it, before it flew away to a bush close by. It probably came from Runtswood or Curtis's brake which are not very far from where I saw it. I had the pleasure of seeing two more hawfinches together, on August 29th, and one on the following morning at Hogshaw about one hundred yards from the place where I saw the first.

On July 25th, 1889, my cousin saw a red-backed butcher-bird, and I myself found two nests of this bird near a brook here, a few years ago. This bird is rare in this neighbourhood, but now and again one may be seen, and a nest found.

A woodcock was shot here in the winter-time a year ago, and a lesser spotted woodpecker was shot here in an orchard two or three years ago. A few kingfishers have now and then been shot along the brook-sides around here, during the winter-time, and one was seen on November 26th last.

A white skylark was seen on a ploughing at Buxlow last August, in company with other larks. A white sparrow has also been seen amongst a flock of its companions at Quainton, by Mr. William Anstiss of this village. The same person told me that he caught in the nets recently a blackbird with some white feathers on its breast. It might possibly have been a ring-ousel.

A couple of summer-snipes, or common sandpipers were shot near Hagditch pond on the 10th of May last year, by Mr. Henry Anstiss, my cousin being present with him at the time. I saw two of these birds around a large pond at Fullbrook, early in May in 1888.

He told my cousin that his father many years ago went after a curlew which was about the slough (a field near this village), but he could not get near enough to shoot it. I have also been told by a younger member of the family, and so has my cousin, that his father several years ago shot a fine plumaged bird, amongst a flock of sparrows in a field called "Ander's Oak." He said it was a little larger than a house-sparrow with a rather long tail; the head is blue, and the body is mottled, and is of various colours. The upper part of the bill (he said) hooked over the under portion. I am inclined to think that this bird mentioned is a crossbill.

Mr. H. Anstiss told my cousin that he shot a night-hawk or fern-owl a few years ago, during the autumn or winter-time, as it flew out of an old cow-shed. One was heard on the evening of the 10th of May, last year, by my cousin.

He also told him that when he was out shooting in the winter-time with some one else, he saw a flock of snipes containing twenty or more, but he thought they were starlings till they were out of gunshot. A green whistling plover or golden plover has also been shot in this neighbourhood a few years ago by the same person. Many other interesting observations in bird life have been noticed, by one or another of the family, and the information they give about them is thoroughly reliable.

H. G. WARD.

WE have received Part I. vol. i. of what promises to be a most important work on "British Flies" (Diptera) by the Hon. M. Cordelia E. Leigh and F. O. Theobald. It is being issued in one shilling parts by Elliot Stock, 62, Paternoster Row.

MIGRATION OF BUTTERFLIES, JAMAICA.

IT is desirable to place on record the migration of butterflies which we have witnessed in Jamaica this year. I first noticed that butterflies were steering a defined course on the first Sunday in May, but they had been unusually numerous for some days before that. Their course was from south-east to north-west. During the whole of May, and far into June, the migration continued, and always in the same direction. Singularly, very few entered houses. Their numbers varied from day to day, but occasionally one might have said, as Darwin's sailors of the *Beagle* did, that it was snowing butterflies. The air was thick with them. In the evenings the drift slackened, and some of the trees near my house would be covered with as many butterflies as leaves.

I have no information as to their starting-point, but during the time they were passing Kingstown, I was informed that the flight had been met with by seamen near the Cayman Islands in long. W. 80°, about 100 miles north-west of Jamaica.

A friend gives me the names of the butterflies as *Synchloë joppa* (Boridv.), *Kricogonia terina* (Luc.), *Callidryas sennæ* (Linn.), and *Amynthia mærula* (Fabr.). The first three were in myriads, the last common, and I am doubtful how far its movements were migratory. I am told that these swarms of butterflies are well known here; this is the first time I have remarked them in a residence of four years.

The migrations are certainly not of the annual character they are in Ceylon, where I have seen them year after year; there they were never so prolonged, or the butterflies so numerous. Emerson Tennent gives as the butterflies taking part in the Ceylon migrations *Callidryas hilariæ*, *C. alcmeone*, *C. pyranthe*, with straggling individuals of the genus Euplœa.

All flights of butterflies have not the same direction. In Alabama in 1890, (United States Government Entomological Journal, April 1891), *Callidryas enbule* migrated from north-west to south-east. One recent flight was from south-east to north-west. Lyell speaks of *Vanessa cardui* flying from north to south. Tennent's Ceylon butterflies fly north-easterly. Kirby and Spence mention a migration of bugs going west.

In these migrations an understood purpose there can hardly be; failure of food may compel emigration, but would not give direction. What impulse within or, it may be, compulsion without gives unanimity of effort to these myriads, and the resemblance of set purpose? What directs their flight, and what is the end of their journeyings?

J. W. PLAXTON.

Kingston, Jamaica.

CHEAP BREAD.

AS a rule the price of grain, and that of wheat in particular, rises in this country when there are most, and again when there are fewest spots upon the sun, and then we may expect an outcry among agriculturists and commercial panics. We have, thanks to Professor Thorold Rogers ("A History of Agriculture and Prices in England"), over six centuries of corn statistics, and thanks to Professor Wolf, over three centuries of sun-spot statistics, to substantiate these assertions. Firstly, then we gather, that the following have been the years of most and fewest sun-spots, as observed by astronomers since the employment of the telescope in Europe. 1610, 1615, 1619, 1626, 1634, 1639, 1645, 1649, 1655, 1660, 1666, 1675, 1679, 1685, 1689, 1693, 1698, 1705, 1712, 1718, 1723, 1727, 1734, 1738, 1745, 1750, 1755, 1761, 1766, 1769, 1775, 1778, 1784, 1788, 1798, 1804, 1810, 1816, 1823, 1829, 1833, 1837, 1843, 1848, 1855, 1860, 1867, 1870, 1878, 1882. Since the average spacing of these years is alternately eight and three years, it evidently follows that commencing with the mean year 1612, and substracting eight and three alternately, we may in approximation continue this series backwards: or commencing with the mean year 1887 and adding three and eight alternately, we may continue it prophetically forwards, leaving the revelation of the exact epochs to astronomers. Secondly we gather that the following years are those in which grain, and more especially wheat, has been highest in price in the United Kingdom. 1259, 1262, 1271, 1274, 1283, 1290, 1294, 1299, 1304, 1309, 1316, 1321, 1331, 1339, 1346, 1351, 1357, 1363, 1369, 1374, 1380, 1384, 1390, 1396, 1400, 1409, 1416, 1420, 1426, 1432, 1438, 1445, 1450, 1457, 1461, 1469, 1477, 1482, 1491, 1496, 1501, 1507, 1512, 1520, 1527, 1536, 1545, 1551, 1556, 1563, 1566, 1573, 1577—1648, 1659, 1661, 1665, 1674, 1679, 1685, 1688, 1693, 1698, 1704, 1709, 1720, 1725, 1728, 1735, 1740, 1746, 1753, 1757, 1764, 1767, 1774, 1777, 1783, 1790, 1796, 1801, 1812, 1816, 1825, 1831, 1839, 1844, 1847, 1855, 1862, 1867, 1873, 1877, 1881. As the former portion of this series of years, for the possibility of whose determination w are indebted to Professor Thorold Rogers, have the same intervals as the latter portion extracted from Government statistics; it becomes apparent that they in like manner approximate the epochs of most and fewest sun-spots; an impression that will be further confirmed on extending that series backwards in the manner suggested; so that it only remains to show why any particular years in the series do not exactly coincide with these epochs of most or fewest sun-spots. "Rain, rain, go to Spain," says the nursery rhyme; and here it strikes me this might occur from the circumstance that the year of most sun-spots is not the wettest or windiest in this corner of the globe, or that the year of fewest sun-spots is not, for these are times of atmospherical disturbance depending on the brightening and tarnishing of the sun, whose cold patches must variously impinge, and quite distinct from the conception of years. Now according to Symons the wettest and most uncomfortable years to joint and sinew in Great Britain have been 1836, 1841, 1848, 1852, and 1860; but it is at once plain that these have not in the highest degree affected the price of wheat, whereas the influence of the windy or weather years 1846 and 1872 in displacement is, as might be supposed, marked. We ought also to have the statistics of other corn-producing countries, and a knowledge of import and export, to perfectly eliminate all disturbing elements; but as it is, the agreement of the two series of figures will to the unprejudiced mind appear very close; and since these are far more extensive than any Sir William Herschel can be supposed to have had at his disposal, it will be to no purpose quoting, as is too often done, his views on this subject; while we place the laurel on the shrine of his genius, and claim him as the patron and instigator of such researches. Carrington's diagram, on which the designer set little value, may be mentioned; what this chiefly shows is not how the Corn Laws came to be repealed in the aforementioned year 1846, but how the price of wheat was exaggerated during our wars with Bonaparte between 1790 and 1820. The drop in the price of corn in this country comes in the hollow of the monetary waves between the epoch of most and fewest sun-spots, and in a less degree perhaps between that of fewest and most; but this matter, as we shall see, is less curious; nor is it very clear that the remarkable falls in price are due to home produce. There was a remarkable one in 1743 and 1744.

The task is done. As I watch from my window the Wain, the reaping-hook of the north, move in its nightly course around the pole until it stands upon its handle, I recall the cornfields of the dog-days in their coat of many colours tissued with sleepy poppies, bluebottles and cockles, pheasant's-eyes and poor man's weatherglass. How I love them, for there have wandered the enchantresses of fame. The devotee of Delphi, the athlete, silly thing, with a bosom on fire like Vulcan's, chanting to the cold and fruitless moon: the more devilish Canidia, grown old and ugly; Clorinda at hide and seek in some ivy-entwined cypress; the witch of Endor, who seems to have found out how to clench matters with the bottomless pit; perhaps some Assyriologist may yet inform us how: besides which all those fairer stars who with love and song broke the bars of death. Well, I have seen the universe of suns look lovelier certainly on the corn lands of Castile than here in the Midlands, and the mystery of philters and ribbons I scarcely comprehend; at hand is but a well-thumbed Collier's English History, which when a dunce at school so monopolized the shining hours, wherewith to renew these forbidden delights, and here the page. "The close of 1857 was a gloomy time in the commercial world. Mad speculation having plunged the traders of America into difficulties, the effect was severely felt in Europe. Many long-established houses of business failed. Those that were working without capital, on accommodation-bills, speedily fell; and in the crash more than one of the banks came down, ruined by those to whom they had advanced money with reckless imprudence. It was the old story of 1720 and 1797, of 1825 and 1847, told over again—men rich in paper, dreaming that they are rich in gold." Softly, these epochs of the sun already quoted would appear to be an index to our dear wheat, our dear barley, our dear oats, our discontent and our panics. The puppets of history, they are all here, black as the damning drops from the archangel's pen, and the shock I received at the discovery caused me to fling book and paper aside as if all the suns had turned on me their batteries; while before my eyes, conjured up by the figures, undulated in lean and hungry procession, the Mad Parliament, very doubtlessly; the Black Death; Wat Tyler and Jack Straw; Jack Cade; the Defence of the Faith and the Suppression of the Monasteries; the Rack and Bonfires; Ship Money; the Headsman; the Plague and Great Fire; the South Sea Bubble. I can no more; let the intelligent reader recount if any be absent, and should he doubt my numbers let him count the grains of corn in the field until he find the error, for here is no superstition, no conjunction of heavenly bodies, no comets that come and cease to be. The morning breaks and our sun arises and shines as it has shone and will shine. The glory of Sepharvaim, of On, of Baalbec is departed, their corn-overseers have vanished, but here in my hand I hold their "Mene, Mene, Tekel, Upharsin," safe and sure. Froude the historian seems to think that Christianity is no longer any use, and enquires, What next? But though it be scientifically possible to call to account the man of destiny and star-born hero, how about our wars in the Middle Ages, feline and fanatical, and now-a-days waged with an eye to the balance of power? Are we to encourage free trade or protection?

A. H. SWINTON.

"MY METHOD."

I HAVE been so often asked in what way I managed to preserve my botanical specimens with more than usual of their natural colour and form, that I think it may interest some of your readers who are collectors, to know the method I pursue.

I tried many devices before I succeeded in any way to my own satisfaction. At the best of times the beautiful blossoms must lose much of their form and brilliant colouring, and will even with the greatest possible care occasionally justify the goodnatured smile of an "outsider," when shown triumphantly some valuable specimen by an enthusiastic botanist.

I tried for many years all the usual ways, "drying"-papers, blotting-paper, etc., and changing the papers each day, till I once found a flower accidentally left in a book, and beautifully dried—a small blue campanula, one of the most difficult colours to preserve, and took the hint. I keep a library of old yellow novels, pamphlets, directories, etc., and dry all my smaller specimens in them, not putting more than five or six in each, and I find that they are compressed enough by tightening the books with elastic bands, three put on lengthwise, and four or five across the book, as tight as they can be put on. Then I place my books where there is a good draught (if possible on a sunny window-sill), putting under each end of the book a little prop so that the air circulates freely round it, and I never open my book for a week, by which time the specimens are generally perfectly dry, and the colour wonderfully well preserved. Fingering the half-dried plants invariably spoils the colours, turning some almost black. In this way the plants dry much more quickly than in the usual plan of putting them in the soft drying-paper, which keeps moist.

The orchidaceous and other succulent plants are the most perplexing and difficult to deal with, but I have to some extent succeeded with them by the following plan. I cut the specimens across, and dry each part separately. In the stalk of the upper part, from the blossom down, I make a slight slit and placing a bit of blotting-paper on it press out the moisture with a small paper-knife; amongst the blossoms of the spike I put sundry small bits of white writing-paper, and shut up my book tightly, with not more than three orchids in it. The small bits of paper prevent the blossoms sticking together, and drying in a shapeless mass, and also keep the colour better. The other parts are easily dried by slitting the stalks as above mentioned; and the leaves also, by this method, do not become so black as is usual with orchids in drying, sometimes I have managed to keep them quite green.

I never dry large specimens of any sort without dividing them; it is easy to put the parts together again. The top of the plant, with its bunch of heavy buds and blossoms, effectually prevents the delicate leaves drying successfully.

Roses present a great difficulty, and such flowers as ox-eye daisies, etc. The rose I place on its face and use a number of "compresses" the size of the blossom, and each with a hole cut in the centre large enough to let the back through, till the compress is on a level with the top; the same with the ox-eye, only of course reversing the position of the blossom; such-like flowers are comparatively easy to settle, and one is amply rewarded by the outside florets remaining their full size, instead of being crumpled up to less than a quarter their length. I must add that I dry my books most carefully after taking the specimens out of them.

Very large specimens I dry in piles of newspapers (a newspaper doubled in four is generally large enough for mine), with a stout pasteboard of the same size under and over, and the elastic bands tightly bound over all, and with plenty of sun and air it is most successful.

Perhaps all this sounds very troublesome, but it takes less time than changing the papers each day according to the old system, and will be found far better and satisfactory if properly carried out.

T. GRIERSON.

NOTES ON THE FLORA OF BRAUNTON BURROWS, NORTH DEVON.

WHILST on a visit to North Devonshire during the early part of August, I had an opportunity of spending a few hours on the botanically well-known Braunton Burrows, which I have seen described as a "sandy paradise of botanists," and perhaps my fellow-readers of SCIENCE-GOSSIP would be interested to know what plants I noticed there. The "burrows" consist of a tract of sand-dunes, forming a large portion of the delta of the rivers Taw and Torridge, extending probably five or six miles along the sea coast. For about a quarter of a mile inland from high-water mark the sand-hills are very sterile, their position being constantly altered by the action of the wind, the only vegetation that has been able to gain a footing being some tufts of very coarse grass, with a specimen here and there of prickly saltwort (*Salsola kali*), three or four species of spurge, including the sea spurge (*Euphorbia paralia*) and the Portland spurge (*E. Portlandica*), henbane (*Hyoscyamus niger*) and the hound's-tongue (*Cynoglossum officinale*). But a little further inland the flora is exceedingly luxuriant, for miles the Burrows are covered with some of the most beautiful and interesting of our native plants, including a number of species that are rare, and several peculiar to this particular district. Perhaps the most striking plant here is the viper's bugloss (*Echium vulgare*); many parts of the Burrows are literally gay with its intensely blue flowers, its relative the small bugloss (*Lycopus arvensis*) being also common. The rare sharp-fruited rush (*Juncus acutus*) forms here and there dense rigid patches, the stems are about four feet high, ending in exceedingly strong sharp points, the fruits are larger and harder than our other species of Juncus. Amongst the ranker kinds of vegetation I noticed the Gromwell (*Lithospermum officinale*), which had almost done flowering, but could easily be identified by its intensely hard white shining fruits, flea-bane (*Inula dysenterica*), sea-holly (*Eryngium maritimum*), which, strange to say, seems rare in this district, wild celery (*Apium graveolens*) and dyer's-weed (*Reseda luteola*).

In several places the well-known soap-wort, (*Saponaria officinalis*), so often found as an escape from cottage gardens, is extremely abundant, and grows very luxuriantly a considerable distance from habitations. I think it may be justly considered as indigenous here; Bentham says "perhaps really native on the coast of Devon and Cornwall."

Still further inland I saw a few plants of the wild clary (*Salvia verbenaca*), which is a fairly common plant in this part of North Devon; very fine specimens of the mullen (*Verbascum thapsus*), wild vervein (*Verbena officinalis*)—I could only find one plant; wild succory (*Cichorium intybus*), sheep's-bit (*Jasione montana*), and many other commoner, but equally beautiful plants. But it is in the boggy parts of the "Burrows" that the most interesting species occur. Between the hills in many places the soil, although consisting almost entirely of sand, contains so much moisture as to have quite a marshy character, and many marsh-loving plants grow luxuriantly. The sea-pansy (*Viola Curtisii*) is exceedingly abundant, its pretty little yellow flower is one of the gems of the "Burrows"; this is considered by Bentham as a mere variety of *V. lutea*; it is intermediate between this and the garden pansy. The beautiful little bog pimpernel (*Anagallis tenella*) grows plentifully along with it, its pink flowers forming a pleasant contrast. The dwarf centaury (*Erythræa pulchella*); brook-weed (*Samolus valerandi*), the specimens of this plant are very small, usually about three inches high and often much less. The very rare yellow Bartsia (*Bartsia viscosa*) I only saw in one place, it grew along with the common red species (*B. odentites*). The stork's-bill (*Erodium cicutarium*) is one of the commonest plants on the "Burrows," varying much in size according to the nature of the situations. I also saw the milk-wort (*Polygala vulgaris*), sea-lavender (*Statice limonium*), thrift (*Armeria maritima*), and the stinking iris (*Iris fœtidissima*); the latter plant was in fruit. These are only a very few out of a great many commoner plants I noticed in the few hours I spent in the district; probably had I time for another visit, I might have noticed many other species.

I may add that this is the only British station for the roundheaded club-rush (*Scirpus holoschœnus*); it is said to be plentiful on the "Burrows," but I was disappointed in not finding it. The sea-stock (*Matthiola sinuata*), bastard pimpernel (*Centunculus minimus*), sea-knotgrass (*Polygonum maritimum*) and marsh helleborine (*Epipactus palustris*), are also recorded for Braunton Burrows.

I think I have said sufficient to show that this station would be well worth a visit from any of the botanical readers of SCIENCE-GOSSIP who may be spending a holiday in Devonshire.

JOHN COLLINS.

Birmingham.

EGYPT AND GUIANA.

A COINCIDENCE.

THE study of the progress of mankind in the art of manufacture is a subject of great attraction to the student of science; any detail, therefore, which bears upon the art, adds one more link to the chain of knowledge.

Referring to the native Indians of the South American Continent, and more especially to the inhabitants of the vast regions of Guiana, it has been noted as a very remarkable coincidence, that the decorative patterns which frequently ornament the borders of the "Simarri" or grater (a flat slab of wood, surfaced with a resinous gum, embedded with numerous small pieces of flint upon which to grate edible roots), resemble the fret patterns of ancient

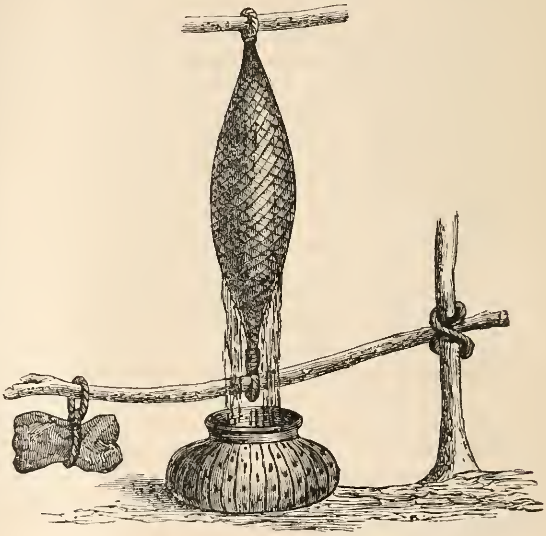

Fig. 188.—Guiana Root-press.

times; the Greek key or Meander device, so common in Egyptian and Assyrian ornamentation and on Etruscan and Greek vases, being of constant occurrence. The coincidence is certainly striking, but a fact still remains with regard to which, so far as known, no attention has been hitherto paid.

If we turn to the "Matapi" or Strainer (a long cylindrical plaited case, permitting of great circumferential expansion and contraction, wherein the grated roots are subjected to great pressure for the expulsion of their juices), its origin appears buried in oblivion. Some wild tribes go so far as to ascribe its knowledge as a gift imparted direct to them by the beneficence of their deity, but beyond this the question remains unanswered.

But once more do the long ages of the past cast back their beams of light upon the enquiries of the present, and so it is upon Egyptian monuments that we now find the desired and striking clue.

In the pages of Cassell's "Bible Dictionary" may be seen an illustration of an ancient Egyptian wine-press, and clearly we have here the origin of the Matapi of Guiana, and this, coupled with the remarkable use of the Greek, or rather shall we say the

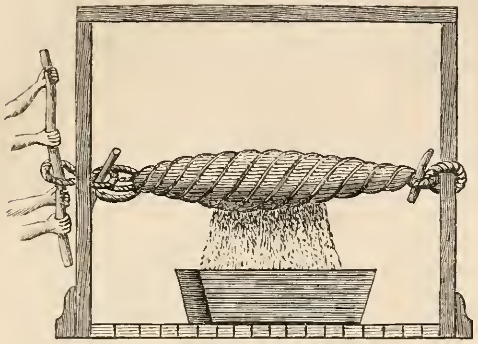

Fig. 189.—Egyptian Grape-press.

Egyptian key device, sets the mind pondering over time and space to discover, if it can, how is it that these modes of earliest decorations and manufacture by old-world African civilisation, have reached and still retain their hold in darkest regions, and after the lapse of centuries reappear upon modern civilization out from the very depths of the forests in the South American new world.

George S. Parkinson.

THE ORCHARD ORIOLE OF THE UNITED STATES.

BEHIND the old farmhouse, stretching from the barn on one side to the lane which leads back to the hill-wood lot on the other, stands the ancient orchard. It was planted, perhaps, a century ago, when this old farm was one of the frontier settlements of civilisation, and owes its origin to seeds brought from Rhode Island or Vermont, or possibly from England itself. The trees have grown to their full stature, and their interlocking boughs present a continuous canopy of shade, except here and there one has fallen under some fierce blast, and has been removed for fuel. The stumps of these unfortunates soon became nuclei for thickets of briers sown by the winds from the raspberry and blackberry vines along the fence; their rotting roots were quickly honey-combed by the galleries of the ants, and their dense coverts formed a place of refuge for the grass-snakes, and the occasional blacksnake or two that crept up from the brook. Only the wood-pile, the vegetable patch, and a line of currant and gooseberry bushes intervenes between the back porch and the firm turf over which you walk between the gnarled and leaning trunks.

No part of the farm is more delightful, it is the first attraction of the city visitor, and the loved lounging-place of the rustic in his idle moments. In April he watches the earliest opening of the foliage, greets the first reddening flower-buds, and gazes with admiration upon the whitening blossoms making a vast bouquet of each aged tree, and rejuvenating it. Then as the flowers carpet the sward with their rosy petals, and the tiny calyces grow larger and greener day by day, he observes with interest the fattening of the little apples, speculates on the prospect of a good yield, and by August tries his teeth on a yellowish one that has fallen, perhaps finding a single palatable bit on that side of it which has been next to the sun. Then the harvest:—

"But shake your fruit from the orchard-tree
To the tune of the brook and the hum of the bee,
And the chipmunks chirping every minute,
And the clear, sweet note of the gay little linnet,
And the grass and the flowers,
And the long summer hours,
And the flavour of sun and breeze are in it."

How the red and yellow and russet apples lie in bright heaps on the grass, forming great circles about each trunk, reflecting the ruddy afternoon sun, as it glints among the branches, and shimmers through the September haze in a soft golden glory, while dim in the dusk the veery carols on the tree-top, and from the fence down by the brook, a thrasher whistles his happy "Good-night!"

The orchard is beloved of all the birds, but with some it is a chosen and constant home, so that you will find them almost nowhere else. So manifest is this preference that one bird at least takes its name from the circumstance; I speak of the orchard oriole (*Icterus spurius*, Linn.), which is well known everywhere outside of New England, as far west as the Great Plains.

Although by no means a dandy like the Baltimore oriole, he is every inch a gentleman, and wears his neat dress of crimson and black with an aristocratic air. Yet he is not above work. No bird is more carelessly active, and none is a better friend of the agriculturist, for from his first arrival in May until he joins small companies of his fellows for the southward journey in October, he is untiring in his pursuit of just those insects which the orchardist most dreads. A quarter of an hour's watching of one will satisfy anybody of his claim to our admiration and thanks. He flies to a branch, moves his head from side to side, spies a canker-worm trusting—vain hope!—to its colour to hide it on the green surface of a leaf, and pounces upon it in an instant; then a nest of tent-caterpillars catches his eye, and he attacks it furiously, ramming down the shreds of silk, and greedily eating every one of the writhing and horrid mass of hairy worms, a meal few other birds will undertake. Even that does not satiate him, and he restlessly renews the search for those creeping larvæ of insects so desirable to him and his family, and so hateful to the farmer. He seems to revel in his work, and hurries about with a busy and gleeful air, heedless of your espionage, his crimson coat gleaming among the glossy leaves or contrasting sharply with the aromatic blossoms.

Though in this steady and diligent search for insect-food, he helps the orchardist by the destruction of hordes of noxious and well-hidden kinds, yet of course, not having any such purpose in view, and making no benevolent distinction when his palate is suited, he undoubtedly snaps up many an insect which is perfectly harmless to both tree and fruit, or does positive harm by killing such as prey upon the enemies of the apple-cultivator. Yet, when I examine his list of foods, I cannot but think that the average of good achieved against evil done is greatly in his favour.

The gaiety which marks all his actions, also characterizes his song. He whistles a clear full tune, not the richly modulated music of the Baltimore, but a sprightly impromptu air, hastening from note to note as though singing against time, and yet under a protest at the speed he is obliged to assume, and with an embarrassed feeling that he is not doing his best. This remarkable song is altogether indescribable, and is not heard with much regularity after the 1st of June, as he knows the necessity of controlling his exuberant spirits for the sake of the safety of his defenceless household.

Finding his pleasure and profit in the garden and in familiarity with men, this oriole makes his home almost exclusively in orchards, and is found breeding there from the Rio Grande to Lake Erie; but rarely to the eastward of the Hudson River. Frequently several nests will be seen in adjoining trees, all the proprietors on the most neighbourly terms with each other, and with other birds. The nest is ordinarily suspended only a few feet from the ground, between the gnarled twigs near the end of an apple-bough, to which it is strongly bound, and beneath which it is essentially pensile, although by no means so freely swinging a pouch as the structure of the Baltimore oriole. Nevertheless, it is sometimes hung (much after the manner of the Baltimore's) among the pendent tips of drooping willow branches, several of which will be found woven into its sides in such a way as to serve as admirable upright ribs or stays. Such nests are likely to prove of neater workmanship, and perhaps a trifle greater in depth, than others. In both cases, however, the shape and proportions are nearly the same, the cavity being about as large as a coffee-cup. The walls are rather thin, particularly in nests built at the south, where a circulation of air is so desirable.

The material of which this beautiful and easily recognised structure is composed, consists usually of pliant stems, yellowish-green grass, often with the ripe heads left on, giving a somewhat rough appearance in many cases to the outside of the nest. This grass is woven into a firm basket, the stems being closely interlaced as if done with a needle. Sometimes there is a lining of thistle and cotton-wood blossoms, the downy breast-feathers of ducks, etc., forming a soft mat at the bottom. The leaves about the nest are arranged, often apparently by the artful skill of the bird—to shed the rain, shade the sitter, and conceal the domicile, which last intention is so well accomplished that the nest is difficult to discover, no matter how familiar you may be with the orchard or grove in which you are certain it is situated, since its colour harmonises closely with all its surroundings.

While this is the customary type of nest in the interior of the country, and remarkable for its uniformity over a wide region, variations occur on the seaboard. Thus at Trenton, New Jersey, where these orioles have frequented for many years a group of pines and button-woods, near the rural home of Dr. Charles C. Abbott (the well-known naturalist), they build homes of quite different character. In social harmony, several pairs annually place at the extremities of the upper branches, nests which are not hung underneath in any sense, but supported in the midst of a cluster of twigs, and resting upon them and the branch from which they spring.

These nests are formed with care out of the same long flexible grasses used in the pendulous structures; but skilfully intermixed with them are many pine needles, an ingredient which would not be permissible in the other type of architecture. Dr. Abbott tells me that this is the prevailing style throughout all the pine districts of southern New Jersey. On the other hand, in the northern part of the state, fifty to a hundred miles distant, the orchard orioles never fix upon the pine branches as a site, but inhabit the fruit trees exclusively, making a nest of interwoven grasses, not pensile, but upheld as before in the midst of a clump of twigs, to which it is securely fastened. Again, a competent observer in this district tells me he has never known the orioles there to use the same nest twice; whereas at Trenton, not only do they return to the same ancestral tree season after season, but always tear the old nest to pieces with amusing vehemence to obtain material for construction of the new, which are occasionally erected upon the foundations of a previous structure.

The elongated eggs are impure white, marbled with irregular streaks of black and leather-brown, much like those of the Baltimore oriole.

Wilson says that this songster is easily reared from the nest, and in confinement becomes very tame and familiar. "A friend of ours," says Mr. Thomas Gentry, "kept one in a cage for several years, which whistled with remarkable clearness and spirit. It was a particular favourite with its owner, and learned to come at his bidding, and at a given signal would pour forth its choicest music with an energy and power that were truly astonishing."

ERNEST INGERSOLL.

New Haven, Conn., U.S.A.

ROSSENDALE RHIZOPODS.

No. 5.

MOST of the genera of lobose Rhizopods, described in my previous articles, are more or less familiar to every student of pond-life; but few specimens of the genus I have now to describe, will have been seen by any microscopist who has not made a special study of these forms of life. I refer to the beautiful genus Nebela. It is one of the largest genera, and contains eight species, all of great interest from the extraordinary form and arrangement of the elements composing their fairy-like tests. The characters, as given by Professor Leidy, are as follows. "Shell usually compressed, pyriform,

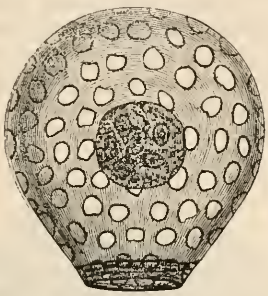

Fig. 190.—*Nebela collaris.*

Fig. 191.—*N. collaris.*

transparent, colourless, (?) with or without appendages, composed of cancellated membrane, or of peculiar intrinsic elements of variable form and size, mostly of circular or oval disks; of narrow rectangular plates or rods; or of thin, less regular, angular plates, often almost exclusively of one or the other, sometimes of two or more intermingled in variable proportions; sometimes of chitinoid membrane incorporated with more or less extrinsic elements; and sometimes of these entirely, as in Difflugia. Mouth inferior, terminal, oval. Sarcode colourless; in form, constitution, and arrangement, as in Difflugia," &c. From these characters, it will be readily seen how much the genus differs, from all the others previously described. This is further exemplified in its habitat. I have never found a single representative of the genus during the twenty years I have been an assiduous collector, in any of the wells, ponds, ditches or other waters I have regularly visited. It is an inhabitant of sphagnous swamps, and is generally found in great numbers in such situations. Rossendale being a hilly district, with a good natural drainage, assisted by art, I was apprehensive that I should be unable to claim this desirable Rhizopod; but as I knew of a small boggy spot about a mile from my house, one bitterly cold afternoon at the end of October I set off, armed only with a wide-mouthed bottle, determined to put the question

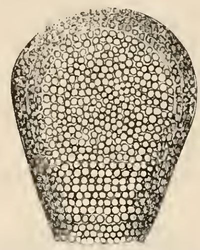

Fig. 192.—*N. collaris.*

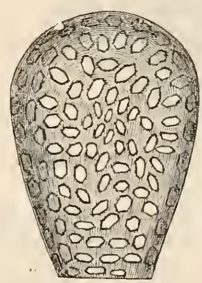

Fig. 193.—*N. collaris.*

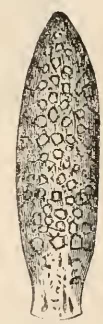

Fig. 194.—*N. collaris* (Side view).

to the test. The side of one of our cloughs had been washed away, at one point, probably through the action of a spring of water, and in the sloping ground for about half a dozen square yards quantities of Sphagnum grew among the coarse grass of the bog. I pulled up a handful of the moss, and all dripping as it was, dropped it into my bottle, and then squeezed other masses of Sphagnum over it. On returning home and quickly placing a drop of water, with broken-down fragments of the moss, on a glass slip, covering this with the usual thin glass, and placing the whole under the microscope, I was delighted to find scores of the beautiful Nebela, of several species, and exhibiting most of the variations so characteristic of the genus. Subsequent examinations proved it to be very rich, not only in these forms, but in several new ones, which latter I reserve for a subsequent article. The two species of Nebela I will now describe, literally swarmed in every drop of water examined.

N. collaris, which was the most numerous form, has the shell a compressed pyriform, longer than broad, though the proportion varies considerably in different specimens; indeed so much is this the case, both in form and constitution, that it is rare to find two specimens exactly alike. I give drawings of a few of the chief varieties I have found, but it would be quite impossible to give them all. Some of the forms I have seen are very obscure, and it is extremely difficult to determine their structure; this is particularly the case in those specimens which have both plates, diatoms and sand-grains intermingled in varying proportions, in their construction. Although it is one of the characters of the genus that the basal membrane is colourless, I have on several occasions seen specimens of a yellow colour, which yet exhibited all the other characters of Nebela. Most of those which came under my observation were either empty shells, or the sarcode was encysted, in the form of a round ball; occasionally, in the latter case the mouth of the shell was closed by a rude operculum, I presume of chitinoid material mixed with ejected food, generally in layers. The shell itself, has, I take it in all cases, a basal membrane, superimposed on, or embedded in which are numbers of silicious plates, round, oval, or rod-like, variously but symmetrically arrayed. These are of different sizes, but this has no sort of relationship with the size of the shell, as a large shell may have small discs, and a small shell large discs. The drawings will give an idea of this variation, so it will be unnecessary for me to enlarge upon this point. The sarcode is colourless, but there are frequently numerous yellow or brown food-balls. The nucleus is impossible to make out, owing to the constitution of the shell, and the coloured food-matters; but two or three contracting vesicles may be seen in favourable specimens. The pseudopodia are finger-like, and rarely more than two or three in number. Leidy gives the average size as $\frac{1}{200}$ of an inch long, $\frac{1}{300}$ broad, and $\frac{1}{500}$ thick; most of my specimens were about that size, though occasional ones were as large as $\frac{1}{90}$, and others as small as the $\frac{1}{350}$ in length.

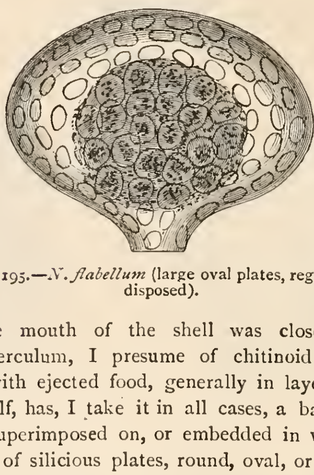

Fig. 195.—*N. flabellum* (large oval plates, regularly disposed).

The other species *Nebela flabellum*, was not nearly so numerously represented in my collection. I do not think that this form ought to have been elevated to specific rank, the only difference being one of general outline; and I think I have seen a few specimens that fairly connect the two. *N. flabellum* is broadly pyriform, or spheroidal, compressed, as in the previous species, generally broader than long, though some of the tests are about equal in this respect. There is also a short neck in all the Rossendale specimens. In size, colour, constitution of shell, condition and character of the sarcode and pseudopodia, and in its habitat, like the preceding form.

N. collaris. Fig. 190. Test composed of irregularly rounded plates evenly distributed over the basal membrane. Sarcode with brown food-balls, encysted; a laminated operculum at the mouth.

Fig. 191. A large, handsome form, of large circular plates, with the intervals filled-in with smaller ones; sarcode encysted.

Fig. 192. Small empty test, entirely of small, round plates.

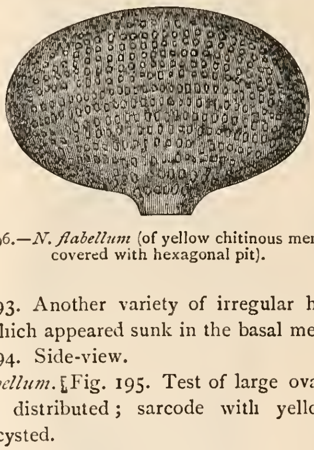

Fig. 196.—*N. flabellum* (of yellow chitinous membrane covered with hexagonal pit).

Fig. 193. Another variety of irregular hexagonal plates, which appeared sunk in the basal membrane.

Fig. 194. Side-view.

N. flabellum. Fig. 195. Test of large oval plates, regularly distributed; sarcode with yellow food-balls, encysted.

Fig. 196. Of yellow chitinoid membrane, cancellated, or reticulated, apparently without plates.

J. E. Lord.

Rawtenstall.

THE WOLF AND THE LAPPS IN SWEDISH LAPLAND, AND INCIDENTALLY IN OTHER PARTS.

By John Wager.

It was remarked once to the present writer by a Lapp, among the snowy mountains of Swedish Lapland, bordering upon Norway, that the reindeer has many enemies. He instanced among the rest man himself; for, though less frequent than formerly, there are, as he said, men even, besides others, of Lappish race, who do not scruple when opportunity offers, to rob the much-enduring nomad by shooting one of his deer, perchance from a boat, as it is grazing on the margin of a river or lake. Yet more persistently, if less fatally hostile, is the broms, a fly whose larva, hatched from eggs laid in the deer's skin, fill it with perforations; and even worse are the attacks of the myggs, or mosquitoes, whose hosts, armed with tormenting, blood-imbibing stings, as the summer advances gather in clouds, and drive the herds and their masters up to snowy altitudes for refuge and relief. The eagle, soaring on ampler wing, snatches not rarely a fawn for its nested young; the ponderous bear, lying in ambush, secures at intervals an elder of the herd; and far more frequently, by similarly lurking under covert, the crafty, insatiable glutton, with claws and teeth hard and sharp as steel, succeeds in springing upon the neck of an antlered victim and drinking its blood. Next to the wolf, and even in some times and places more than the wolf, it is the most destructive northern beast of prey; for it is, more than other beasts, the plague of the cattle-farmer as well as the Lapp. Nevertheless, the wolf is the arch-enemy of the reindeer, and as such is held in utter detestation by the Lapp, who seizes every chance of wreaking vengeance on the ravager of his herds. According to old Lappish traditions, this ravenous beast was not created by a beneficent being, but by Perkel the devil, who endowed it, above all other animals, with swiftness of foot. God, however, to check its speed, added the bushy tail, by throwing after it a twig of spruce fir.

The bitter exasperation of the Lapp against the wolf is not to be wondered at when we consider the labour and the loss to which from time immemorial his hereditary enemy has subjected him, and still subjects. Summer and winter, day and night, he with his faithful dog must be on the alert, guarding the herd. "Indescribable," says Professor Friis, "what the Lapp endures thus watching. When darkness is deepest, cold bitterest, snowstorm fearfulest, he must be on the watch. At least every quarter of an hour he must take his round, hallooing, screaming, and making all manner of loud outcries; for thus the wolf, though only when not very hungry, can be kept aloof." Should he once sleep at his post, the wolf, more watchful than himself, would presently wet his fangs with the blood of a deer. A single wolf, slaughtering like a fiend incarnate, for the love of slaughter, far beyond the needs of appetite, has been known to kill thirty deer in one night; and, as stated by the above-named author (*En Sommer i Finmarken, Russisk Lapland ög Nordkarelen*), from two or three, up to that number, may be lost in a night notwithstanding the strictest watch; while possibly a man, rich in the evening, with several hundred reindeer, may in the morning be a beggar; his herd destroyed, hunted over precipices, and dispersed far and wide by a numerous pack of wolves, some falling into the hands of thieves, and the rest of the living never, by the most strenuous efforts, to be wholly collected together again.

Consideration of such facts leads us to excuse the implacable animosity, if not the barbarous cruelty, directed by the Lapp against the wolf. Not only does he give no quarter to the enemy when it falls under his power alive, but, like a cat playing with a mouse, he tortures it awhile before killing it outright. Fleet as the wolf is on firm ground—and its name in Lappish is synonymous with quick—when deep and loose snow impedes its progress, it is often outrun by the gliding Lapp, who thereupon strikes with his heavy staff a blow on the small of its back, which compels it to sit instantly and immovably on the ground. A sudden thrust at the heart, with the spear-end of the staff, would now terminate the creature's misery; but that were scarce sufficient gratification for the heated and exasperated pursuer's love of revenge. If there are other wolves to be followed, he perhaps leaves his victim awhile, secured by its broken back, and renews the chase; if not, he awaits his lagging comrades, and with them, when they gather round the deliquent in a ring, arraign him in open court, constituting themselves accusers, witnesses and judges all in one. His doom is predetermined, and they have only, as executioners, to enjoy the pleasures of the wild justice called revenge. They denounce him in the most violent of abusive terms; they beat and pommel him, and prick him with the point of their spears; they swear at him; they ban him with the most fearful curses their language, copious in such phraseology, can supply; they upbraid him with all the mischief he and his progenitors throughout all time have ever wrought; and finally, amid shouts of exultation, they put him to death in a manner most calculated to inflict severest pain.

Such, till recently, was a common practice among the Mountain-Lapps: but the present writer was informed a few years since, by a Swedish clergyman, on the authority of a section of those nomads, with whom at intervals he comes in contact, that the custom was greatly on the decrease, passing away before the more genial influences and superior enlightenment, which for some time past have been brought to bear on the raw, untutored minds of these hardy, isolated children of the mountain wilds.

The Lapp rarely shoots the wolf, in Sweden never; he prefers, as a surer weapon than the gun, the use of the staff with which he propels himself on his snow-shoes; and which, to serve both purposes, is formed of a very stout and straight branch of birch-tree, barked and smoothed, provided—in one case seen by the writer—at the upper end with a long, pointed iron spike, firmly secured by a large and strong brass ferule, enclosed in a sheaf of reindeer horn; and at the lower end with an iron spike eight inches in length, being two inches shorter than the pike at the other end. In pursuit of the wolf with such a weapon the hardy, active and enduring skid-runner, gliding and bounding on his skidor, or snow-shoes, often strains his energies to a degree which injures health and shortens life. It is a great honour among the Lapps to outrun and destroy a wolf; and among the Lapp mountains, as among the seats of learning, and the mouths of cannon, there are spirits who eagerly seek the bubble reputation, and are sensitive to the spur of fame. All Lapps, and most, if not all, the peasants of Lapland, man and woman, can run on skids—the narrow, flat snow-shoes, or skates, of rather thin but tough wood, from ten to sixteen feet in length, with upturned points in front; but, though all are adroit at their use, it is not every man, and perhaps no man except a Lapp, who could put salt on the bushy tail of a wolf, or could crack his backbone with the skidstaff, as impelled by terror he flits at his utmost possible speed.

Such chase can only be successfully accomplished on the lower forested tracts, where the wolf's fleet limbs are hampered by sinking into the deep, loose snow, usually lying there during winter; or when the crust, which sometimes forms over it, is too thin to bear his weight without breaking. Then let him beware of showing his grim visage, or his spoor, in the neighbourhood of the herds he has stealthily followed from the mountains. Soon as seen or denoted, by the vigilant watchers and their dogs, notice that the wolf is afoot is carried with all speed to the tent, or tents, and the skidrunners are quickly ready for the hunt. "The wolf," says H. A. Widmark, in a communication to Professor von Düben's important work on Lapland and the Lapps, "from his great capability of persistent exertion, taxes to the utmost the pursuer's powers and pretensions. He must be followed almost continuously day and night, and so constantly disturbed, that at last he becomes exhausted and outrun. Many Lapps therefore take part in a wolf-hunt, although only one or another is properly the hunter. In Jokkmokk at present there are only two who can hold out till the wolf is reached. The ability to "ränne upp" a wolf is not given to many Lapps, and they who have the luck to possess it, destroy their health soon enough by these feats. Throughout the whole day to have no rest, to cast off, for lightness sake, while running one article of clothing after the other, leaving them to be picked up by less rapid pursuers, and to suffer, perhaps, disappointment after all effort—such is the wolf-hunter's experience. For it often happens, that when the hunter has quite nearly approached the wolf, he is obliged to relinquish the chase, because his game has had the good fortune to attain at that moment, the open treeless mountain-lands, where the snow is firm, and towards which, when it is not too distant, he always steers his course, thence keeping watch for another opportunity of approaching the herds. To devote himself for several successive days, even weeks sometimes, to this severe exertion, craves a power of endurance on the part of the hunter, which is rare indeed. His recompense consists in the enjoyment experienced when, after so many arduous toils, he at last thrusts his spear into the body of his foe; but also in that regard, that acknowledgment of merit awarded him by all his kin."

The work entitled *Hos Lappbönder*, by P. A. Lindholm, also contains a graphic description of a wolf-hunt in the south of Swedish Lapland, a translation of which may interest the reader. In late autumn perhaps, traces of the depredating wolf have at intervals been observed in proximity to the herds; though in consequence of strict watch, loud outcries of dogs and men, and vulpine knowledge of the penetrative quality of the herdsman's spear, little or no mischief has hitherto been done. But prevention is better than cure—if cure there could be for a slaughtered reindeer. "Soon," therefore, "as deep snow falls, the quickest skidrunners in the district accoutre themselves for a general hunt. The wolf meantime suspects danger, and takes a start, not seldom of fourteen miles. That helps him little; his spoor is seen in the snow, and soon his pursuers are within hearing. Now it behoves him to flee for his life and his skin; and that he does at the best. Over stocks and stones, through densest forest, and the ruggedest tracts, usually traversible only at the gentlest pace, the hunt flits now at an astonishing speed. When the wolf has not recently fed, he runs not only with rapidity, but also with great persistence; nevertheless here his efforts fall short of the emergency. His pursuers are no common men. That train of short-grown mortals, clad in kilted coats and sugar-loaf caps rustles past like a gust of wind. One verily grows dizzy at the sight of them, speeding like the flight of an arrow, down steep hills; bounding from fathom-high escarpments, or rushing through the closest thickets, where tree-branches permit no cap to be kept on the head. In the course of this onward rush the party becomes separated; all make superhuman efforts, but one naturally wins and takes the lead; each of the rest striving to come as little as possible in the rear of him, and especially to avoid the dishonour of being last. Sometimes, but very seldom, a Lapland peasant joins in the hunt; but his class rarely attain the proficiency in skidrunning possessed by the Lapp.

"His mortal enemy is soon in the power of the foremost hunter, with no mercy to expect; so he turns towards him with a grin, while a cloud of warm vapour issues from his throat. The Lapp laughs at his victim's spite, and gives him in return a violent blow on the loins with his skidstaff, which seats him on the snow. If the wolf was not alone in the chase, he kills him at once and pursues his companions; but otherwise he sets himself before the wounded animal, and gravely dilates on all the delinquencies he and his relatives have perpetrated against the Lapps; then, at the end of this denunciatory sermon, he puts the culprit to death. It has occasionally happened that the Lapp at the moment of striking the disabling blow, has himself also dropped down, in a swoon caused by over-exertion; in which case the wolf, though not respited, is saved the extra infliction of a death-sermon, the victor's comrades being sufficiently occupied with his restoration to conscious life.

"The wolf is not stripped of his skin till all the hunters arrive at the place of his death. Then the slayer, beginning the operation, flays the head; the second in at the death flays the next; and so on till it comes to the last, who gets leave to draw the skin from its tail.

"After the completion of the flaying, the hunters return in the order they held at the end of the chase; the foremost bearing the skin as a trophy of honour; and on arriving at home they are entertained with the best."

In Norway, as appears from Professor Friis's account of a wolf-hunt, the skidstaff of the hunter is not commonly furnished with a spear-head; and the wolf, as he sits with his back broken by a blow with the staff, is after due denunciation of himself and his forefathers, finally despatched with the knife which every Lapp and peasant carries suspended from his belt; or by a ball from the rifle which the Lapp hunter there frequently carries on his back. To strike at the head of the wolf with the skidstaff, says Friis, is of no avail, for the wolf knows how to parry and seize it with his teeth. Yet O. R. Hederström, in the Swedish Sporting-Society's Journal for 1879, states that in Tornelapmark, the most northerly part of Swedish Lapland, an inch-thick skidstaff, without spear, is the only weapon used; and that a blow or two with it, after it has broken his back, is usually enough to kill a wolf—there a cowardly animal, rarely showing fight in self-defence. But, as Malm, quoted by Dühen, relates, a slightly wounded wolf will sometimes turn upon his assailant, especially if he chances to stumble; then a fierce fight ensues, in which however, the Lapp's thick skin coat affords better protection against the wolf's fangs than the wolf's against the Lapp's strong, sharp-pointed knife.

Outside the boundaries of Lapland wolves are not numerous in Sweden; nor even within the lower forested tracts those boundaries enclose, except during winter, after some portion of them have followed the reindeer herds thither from the Lapp mountains, which are their proper resort. They infest chiefly the three northernmost provinces of Sweden, Norrbotten, Vesterbotten, and Ostersund, south of which they are rarely found. Ostersund, the most southern of these provinces, includes the wild mountainous tracts of Jemtland and Herjedal, and though ranged by a few Lapps along its Norwegian border, has no part of its area nominally included within Lapland proper, yet is apparently far more infested by wolves than Vesterbotten, whose lappmarks adjoin it to the north. But these, though of great extent, constitute the smaller part of Swedish Lapland; and it is in the lappmarks of Norrbotten—Pite, Sule, and especially Torne—that both wolves and reindeer most numerously abound. Thus in Norrbotten's län, and of course chiefly in its three lappmarks, there were, according to the premiums paid by the State for the destruction of predacious animals, during the four years of 1876 to 1879 inclusive, sixty-nine wolves killed; in Ostersund's, fifty-six; in Vesterbotten's, sixteen; and throughout the rest of the kingdom, only six, comprising a total of one hundred and forty-seven. During the five years of 1881–1885, the number destroyed throughout all Sweden was one hundred and seventy-one; and during 1871–1875, two hundred and twenty-nine; but during the ten years terminating with 1865, no fewer than four hundred and thirty-seven wolves were killed in the province of Norrbotten alone. There also in the course of the same period seven hundred and eighty-seven gluttons, and two hundred and fifty-seven bears were destroyed; while on the other hand, the number of reindeer slaughtered in the same time and place by such beasts of prey, was stated at about five thousand.

The part of Norrbotten most exposed to the ravages of wolves is Tornis lappmark, which comprises the two parishes of Enontekis and Jukkasjärvi, where, says Herr Hederström, the Jagtmaster or chief ranger of the district, the wolf may be considered to have its especial resort. This wide territory, the largest of the lappmarks, with an area of 7612 square miles, consists mainly of high, bleak, treeless and comparatively level table-land, ranged over during winter by nomadic Lapps, with their great herds of reindeer, but vacated on the approach of summer by both, who pass over into Norway, and remain there till the autumn, thus reversing the usual custom of the more southerly Swedish Lapps, who during summer graze their herds on the mountains, and towards winter begin their descent into the forests below, where they remain till spring. In winter therefore, the high lands of Tornis are numerously bespread with the returned herds; the number of reindeer belonging to it exceeding that of any other lappmark; its share of the 123,000 which all Norrbotten contained in 1879 being 55,000, although Tornis forms only a fourth part of the entire area of the province's lappmarks; while the total number of reindeer throughout the whole of Swedish Lapland has been estimated at only 220,800. This abundance of reindeer during winter in Tornis lappmark is evidently a chief reason why their natural enemies, the wolves, also abound there at that time, for they numerously follow the herds both into Norway and back. They are favoured also by the nature of the country, over whose unsheltered plateaus the winds sweep with a force which compresses the snow, so that it gives firm footing to the wolf, and thus precludes the possibility of overtaking it on snow-skates. Also the Lapps are accounted incompetent marksmen and their rifles equally inefficient.

Encouraged by such conditions, and also, it appears, by the apathy and neglect of the Lapps, in 1879 the number of wolves on this tract, or part of it, had so greatly increased that, as stated by Herr Hederström, they ran in packs from fifteen to forty, and destroyed thousands of reindeer, as they had done during the previous two years—packs more numerous and destruction greater than had been heard of for some years before. The report of enquiry respecting the prevalence of wolves in Enontekis, made about the same time at the instance of the Jagtmaster, supplies some interesting particulars on the subject of these ravenous animals. Six years before few wolves were found there, but they had since greatly increased, and it was estimated that at least a hundred prowled over the parish ; packs of three to fifteen had been seen since the middle of September.

They remain within the parish all the year through, following the reindeer herds on their way to Norway up to the mountain ridge, but not over it ; supporting themselves bounteously during summer on other prey, in the valley of Kumajoki, close under the ridge ; forming quite distinct footpaths there, and extending themselves along the banks of Könkämä river quite down to Kellotijarvi, a lake about sixteen miles above Enontekis church. It is said that lairs of wolves are sometimes found burrowed in the sandhills, like those of the fox.

During the three preceding years it was calculated that each year over a thousand reindeer had been killed in the parish by wolves. The flesh of a deer thus killed acquires a taste so very disagreeable that people are very reluctant to eat it. Yet it is said by Castren, quoted in Düben's work, that the Fjell-lapps of Finland have no need through all the winter to slaughter deer for their own use ; they eat only the reindeer killed and in part eaten by the wolves, which choose the daintiest portions, and especially the blood, which those Lapps, like the wolves themselves, prefer to drink raw.

When the wolf, says the writer of the report, on giving chase has overtaken a reindeer, he seizes it by the thigh, and soon as its speed slackens, grips it in a twinkling by the throat, presently causing its death, and consequent fall. He then tears out and eats its tongue ; next he strips the flesh from the loins nearest the root of the tail, and after eating that continues his repast on the rest. If very hungry, and undisturbed, he gorges the whole deer, its horns included.

The reindeer, as stated by Düben, has the worst chance of escape from the wolf on dark autumn nights when the surface of the snow is sufficiently frozen to bear the weight of the wolf, but not of the deer. The assailant, however, instead of flight, sometimes meets with resistance and a repulse ; examples being given of stags, and especially does with calves, goring a wolf to death ; or even successfully defending themselves with horns and hoofs against a couple of bloodthirsty foes. Indeed it is said that the wolf seldom ventures to rush upon a compact herd, but when fear has dispersed it, pursues a deer that has separated from the rest.

Wolves do not always remain continuously in the same locality, but in many cases remove at intervals from one tract to another, so that the Lapps may sometimes, in certain parts, relax considerably the constant watch of their herds. Östgaard, a Norwegian writer, says that wolves sometimes flock together in great numbers, and especially when about to migrate to another forest tract. Such a gathering is there called a wolf-skred.

Except under the pinch of hunger, the wolf is cowardly ; as Bishop Pontoppidan remarks, he is like the arch-enemy of mankind, resist the brute and he will flee from you ; a cow or even a goat, by such action has put him to flight. It is very rarely, therefore, that he ventures to attack a man ; but it is recorded that a soldier, when returning from parade across the ice over the great lake Storsjö, in Jemtland, was killed and eaten by wolves, his skeleton being found several days afterwards. Previous to that occurrence, namely in 1821, nine or ten children suffered the same fate in Dalecarlia and Gestrictland, which adjoins it, from one and the same wolf, which it was believed had been kept tame. Cases of children being killed by wolves appear to be more frequent in Finland ; two were reported by the newspapers in 1881, as occurring within the province of Abo ; the one, that of a boy ten years of age, who had been sent to fetch a horse from an enclosure within a forest adjacent to the cottage where he dwelt.

Much superstition has been associated with the wolf by Scandinavians as well as Lapps. The malign glare of his eyes, his grin of rage and fear, his reputed habit of tearing the dead from their graves, his revels on battle-fields, and the strange, unearthly howlings to which he gives utterance on dark winter nights, all suggest the idea of a fiendish nature, a being pertaining to the nether world. In the old Norse mythology, he played, in accordance with this character, a conspicuous part. Odin, the god of battles, was attended by two wolves, and doomed at length to be devoured by the great Fenris-wolf (offspring of Loki, the Evil One), when the flames of Ragnärök consumed the world. Two ravenous wolves, personifications of the dark side of nature, born of a hag who dwelt in Iron-wood, the abode of witches, constantly pursued the sun and moon with devouring intent; and their insatiable brother, the wolf-shaped Mänagarm, sought to fill his capacious maw with the blood of dying men.

At the time when the Lapps were accredited with magical powers it was believed that certain men of the race could at pleasure transform themselves, as well as others, into the shape of wolves and bears; and it has been asserted that hunters on flaying such vulpine or ursine semblances have found a Lapp belt under the skin. What multitudes of werewolves during the Dark Ages, when light was dim, used to flock together on Christmas eve to revel and do all manner of mischief, has been made known by Olaus Magnus; and it has also been believed that witches, among other fearful shapes, could assume that of the wolf.

Even in later times the belief has prevailed that Lapps had the power either to infest a district with wolves or to draw them thence. In the *Norske Bygdesagn* of L. Daa, published at Christiania in 1870, it is said that for centuries wolves had been a great plague over all the bailiwick of Nyfylke, excepting a large peninsula which was connected with the mainland by a narrow isthmus called Sandied. Across this isthmus, from time immemorial, a straw-rope had been stretched from sea to sea, suspended on poles so high that the wolves could not leap over it; and under a rope thus extended, experience had shown that they would not go. The sheep, therefore, belonging to the peninsula could be allowed to run out both summer and winter, which was not the case with the numerous flocks on the mainland, notwithstanding some annual contributions by the farmers there to a man for endeavouring to keep the wolves aloof. But in 1777, "the year when men write three sevens," a Lapp came to Sandied, and learning the purpose of the rope, offered for a moderate sum to clear the wolves from the whole district, which, his terms being accepted, was accordingly done. On being asked by the farmers how long they might with certainty rely upon the freedom from wolves, he answered, For the good age of a man; but quite possibly when seven and seventy years had again elapsed, they might come again. Remarkably enough, in 1854, a multitude of wolves did again suddenly make their appearance in Nyfylke, doing great mischief, and causing great alarm among the people, to whom within man's memory they had been unknown. An inscribed silver tablet, bearing date 1777, hangs, or did hang, in Roldal church, to which it was presented by the parishioners of Hjelmaland, as a thank-offering for the freedom from wolves they had that year enjoyed.

In common with the former practice of the Scandinavian peasants, the Lapps refrain from speaking of the wolf by its proper name, using as Von Düben remarks, various designations, which were first given when he was believed to be an evil spirit, whom they could coax into good behaviour. In Swedish folklore they are the most unhallowed of all beasts of prey; their occult influence, or animus, most potent for evil of all. They can revenge attempted injuries: a man in Norway who had thus offended them shortly afterwards broke his leg. Everywhere it is known that the glance of a wolf, itself unseen, will cause the person against whom it is directed to become suddenly hoarse. Yet, if while living the wolf was altogether evil, he was of some use when dead. His skin formed, and continues to form, the warmest of winter robes; the Lapland näid when he used to journey in quest of information to the land of the dead, would probably never have come back if he had not, as a preparation for the journey, partaken of wolf's flesh; a dose of the same, wind-dried and pulverized, served to stimulate Norwegian appetites; and wolf's lung was a chief ingredient of the compound which Norwegian apothecaries formerly prepared as a remedy for consumption.

SCIENCE-GOSSIP.

Dr. Elkin, the astronomer of Yale University, and formerly of the Cape of Good Hope, has, by a long series of observations on the parallel of the star Arcturus, arrived at the conclusion that it moves with the inconceivable velocity of 381 miles a second, that is to say, it would traverse the distance from London to Edinburgh between two ticks of a watch. This is twenty-one times faster than the speed of the earth in its orbit round the sun. Dr. Elkin also finds that Arcturus is so far away from us that his light, travelling 190,000 miles a second, takes 181 years to reach us.

A luminous outburst in the sun was observed recently by M. Trouvelot, at Paris. First, a luminous spot appeared on the disc of the sun near its western limb. It was of a golden yellow tinge, and shortly afterwards a companion spot appeared a little above it. The spectroscope showed the first spot to consist of a central eruption, from which volcanic bombs were thrown to heights above the chromosphere, where they seemed to rest as dazzling balls. A few minutes later these were replaced by brilliant jets or filaments. On the next morning the eruption was seen to be diminishing, and it finally ceased in the afternoon. There was no corresponding magnetic perturbation observed at Kew.

A curious instance of one poison killing another is reported from Yackandandah, Victoria, where Dr. Mueller has recently administered strychnine in cases of snake-bite. A solution of nitrate of strychnine in 240 parts of water, mixed with a little glycerine, is prepared, and twenty minims injected hypodermically at intervals of ten to twenty minutes, according to the virulence of the attack. In some cases a grain of strychnine has been given thus within a few hours. The two poisons are antagonistic, and the characteristic effects of the strychnine only show themselves after the venom has been neutralised. The first independent action of the drug is evinced by slight muscular spasms, and the injections must then be discontinued, unless after a time the snake poison reasserts itself. So long as the latter is active the strychnine can be applied in quantities which would be fatal in the absence of the virus. Out of the hundred patients treated this way, some of whom were at the point of death, there was only one failure, and that arose from the stoppage of the injections after one and a quarter grains of strychnine were administered. Any part of the body will serve for the injection, but Dr. Mueller chooses a part near the snake-bite.

A new patented process for producing photographs in natural colours has been brought out. No claim is put forward to the production of the colours on the negative, a feat which if not impossible has never yet been accomplished. What the negative does is to portray the colours of the original in their proper relative gradation of tone, which is a development of the "ortho-chromatic" process, as photographers term it. Having obtained the negative, the next step is to get a print. This print is made to undergo a special treatment, mechanical in its nature, by which it receives the required colours. Only the primary colours are used, every shade and gradation of tone being secured by the negative. No artistic skill is needed to apply the colours, but how it is done is not explained. The final step consists in the "fixing" of the prints, by which the colours are rendered absolutely permanent. The prints are made waterproof in the process, and can be mounted on paper, card, glass, opal, or other material. The process is the invention of a French photographer, M. Victor Mathieu. The means being mechanical, the cost is but slightly in excess of the ordinary monochrome prints.

Mr. John Aitken has been investigating clouds from the summit of the Rigi and Pilatus. He now finds, as in former observations, that fog is intimately dependent on the presence of dust particles in the air, each of the invisible granules forming the nucleus of a tiny head of water, these vesicles constituting in the aggregate clouds, mists, and their kindred. At elevated situations the air is comparatively free from dust, while lower down it is full of it. But while clouds are passing over a peak the number of particles varies considerably. This, he discovers by a series of carefully compiled data, is due to the fact that the air entering into the clouds has forced itself up from the valley below. Hence the mountain air is pure or impure in exact accordance with the amount of this lower-world current which has reached it. When the cloud vanishes the ether resumes its old composition. Another curious fact just discovered by the same indefatigable observer is that the moment a cloud forms it begins to discharge its contents in the shape of a steady shower of minute drops. These drops are not capable of being appreciated by the unassisted senses; but by the "fog-counter," an instrument of Mr. Aitken's invention, the exact number falling on a given space can be readily noted. What is still more curious is that though the air is in such circumstances saturated with damp, seats, stones, and other large objects near the earth are perfectly dry, the drops being evaporated by the radient heat of the ground; but a pin's head or other small object, not offering the same area, is in these circumstances often covered with a minute globule of water. The fact of a cloud thus beginning to rain small drops whenever it is formed may account for the disappearance of these vaporous masses without any change in the wind or temperature. They gradually exhaust themselves.

M. Janssen, the enterprising French astronomer, is not satisfied with the hope of building an astronomical observatory on the summit of Mont Blanc, for which the depth of snow is now being sounded by a horizontal tunnel; he aims at establishing another at Tashkend, in Russian Turkestan, where the skies are of a remarkable purity. The Governor of Turkestan has found the money, and is taking an intelligent interest in the work. Observations of the spectroscope will be one of the specialities of the place.

The specific influence exerted by the eucalyptus-tree on fevers has long been well-known. Whole districts in Algeria and other countries which were formerly mere haunts of malaria are now, since the "blue-gum" has been planted, perfectly healthy. In Australia it has been found that green branches placed in a room act as a powerful disinfectant. In cases of scarlet fever, if the branches be placed under the bed, the bedding undergoes a thorough disinfection, the volatile vapour penetrating and saturating the mattress and every other article in the room.

Herr Prausnitz has recently collected the dust in various compartments of trains, which often convey patients from Berlin to Meran, and inoculated a number of guinea-pigs with it. Two out of five compartments so examined were found to contain the phthisis bacillus; the dust of one rendered three out of four guinea-pigs tuberculous; that of the other, two.

The action of sea-water on cements has been investigated by M. Candlot with important practical results. He finds that the sulphate of lime derived from the decomposition of the sulphate of magnesia by the lime salts of the cement combines with aluminate of lime to give a double crystalline salt containing half its weight of water. The crystallisation of a salt so full of water—or so "hydrated," to use the chemical term—involves considerable swelling, which accounts for the breaking up of cements in marine work, such as piers, breakwaters, and the like.

A very suggestive paper has just been published by Mr. James Weir (read before the Institute of Marine Engineers) entitled "Steam Engine Efficiency: a comparison of Nature's Engine and Modern Practice."

ZOOLOGY.

On the Burrowing Habits of the Genus Testacella (Cuvier).—Respecting Mr. Horsman's remarks on my paper published last March in the "Naturalist," "On the Burrowing Habits of Certain Land and Freshwater Mollusca," it appears very evident to me that his conclusions were drawn from insufficient observations. Mr. Horsman informs me that his observations extended over a period of five or six months, and were carried out under artificial conditions. Under these circumstances, it is hardly fair, I think, to criticise observations made from nature. "A fairly heavy soil" kept in a "large old tank in an outhouse" would soon become caked and very firm, and consequently it would be almost impossible for a mollusc to get below twelve inches, in fact I do not contend that in heavy soils molluscs do burrow to great depth. Where I saw *T. haliotidea*, it was in a light loamy soil. Mr. Horsman speaks of the average depth as five or six inches; now had he paid the slightest attention to the habits of our British slugs in their natural conditions he would know that most of them burrow to that depth when depositing their eggs, as has been described by Moquin Tandon and other writers. I have not had the opportunity of studying *T. scutulum*, but from what I know of the habits of *T. haliotidea*, I cannot see any valid reason to doubt the accuracy of Mr. Quilter's observations, nor do I agree that Dr. Jeffrey's statement is open to question. The other records mentioned in my paper are all from well-known conchologists and careful observers, and I fail to see any cause for doubting them.—*W. E. Collinge.*

Early Butterflies.—Mr. Lowe, a short time ago, stated that on the 3rd of June, he took a freshly emerged specimen of *C. edusa*, and he asked whether that is not very early for its appearance. If he thinks it was freshly emerged simply because it was fresh-looking, I think he may be mistaken, for as a rule *edusa* hybernates as an imago, though Newman does speak of one that, contrary to the habit of the species, passed the winter as a chrysalis. I say I think Mr. Lowe may have been mistaken, for on referring to my note-book for the current year, I see it was on the 8th of June that I saw the first specimens of *V. cardui*, an insect which also hybernates in the perfect state, and I find I made the following note, "Saw four or five *V. cardui*, all looked remarkably fresh and as if just out of the chrysalis." I have no reason, however, to suppose that these butterflies did not—as the species does—hybernate as imagos, nor do I think it likely that Mr. Lowe's *edusa* had not followed the usual habit of that species. *Cardui* and *atalanta* were very numerous here this year, especially in the larval condition. I found the former feeding on both the common nettles, also on *Carduus arvensis*, *C. pycnocephalus*, but I think it seemed to prefer the small nettle (*U. urens*) to any other food. Curiously enough I took one half-grown larva off the common mallow and reared it solely on that. It preferred blossoms to leaves and would not eat the latter when flowers were to be had. As I am on the subject of butterflies, I may mention that *C. edusa* has been scarce hereabouts this autumn. I have traversed the Downs in all directions almost daily since the beginning of September, and during my excursions I have visited most of the clover-fields within several miles of this place, the result being that I found this insect plentiful at only one spot. This was a small clover-field of about six acres, near the lighthouse W. of Beachy Head. Some six or eight visits to this resulted in my securing about 120. Twenty-two of these were females, the rest males. Of the former two were very fine examples of the variety *Helice*. Early in the month they were in very fine condition except that about one in six had a large notch in one or two of its wings. At first I could not account for this, but I soon discovered that the injuries were caused by wheatears, which frequented the field, and which poised on the top of a stalk of clover, or hovering kestrel-like about a foot above the level of the field, kept a sharp look-out for passing butterflies, and whenever *edusa* came near enough the bird darted at it like an arrow, and though I never saw any butterflies secured I could see plainly that that was how they got so damaged. On one occasion, the insect when attacked mounted like a heron pursued by a peregrine. It was most interesting to note the extremely rapid movements of *edusa* as it fled from and dodged its pursuer with a celerity that was marvellous. When they had mounted until they were almost invisible the bird suddenly relinquished the chase, and dropping quickly to the ground was instantly followed by the butterfly, which immediately resumed its rapid questing flight over the clover, just as if nothing had happened. I will only add one more note. About three weeks ago a very fine healthy caterpillar of *D. galii* (found on the Downs) was brought to me, and it has since safely pupated.—*R. B. P.*, *Eastbourne.*

NEW ROTIFERS.—"*Distyla musicola*," pages 205 and 206 should read "*Distyla muscicola*"—that is, the moss-dwelling Distyla. As printed, the name has no meaning, and in an original description the error is of some little importance. I must apologise for the trouble given you, and I fear I must have overlooked the error, so far as that one occurring in the text, in my revision of the proof.—*D. Bryce.*

APHIDES AND THEIR MONUMENTS.—Being but a poor entomologist—if indeed an entomologist at all—I am not ashamed, after a diligent but fruitless search through the few books on the subject within my reach, to ask information from those of your correspondents who may be more advanced in the study, on a few points which have interested me greatly, and from the observation of which—thanks to my ignorance, I suppose—I have experienced, this summer, many a delightful thrill such as some lovers of nature are privileged to feel when a new light "beats" upon them. I was hunting very successfully for the so-called leaf-insect (fan-insect I think would be a better name), the beautiful "abnormal" larva of the *Aphis aceris*, and was led to the examination of sycamore leaves, which also supplied abundance of specimens. But besides these there were numerous full-winged aphides quite dead, and most of them perfect; with others in various stages of dry dilapidation, each seated on and firmly fixed to a flat, circular bag which under high magnifying power proved to be loosely woven of hair-like web. In some of these bags I found a living larva resembling a minute white nut-maggot. There was no discoverable hole in the bag by which it could have entered, and how it came there is as great a puzzle to me as the apple inside the dumpling was to his majesty George III., and possibly as easily explained by the initiated. Any way, this fairly-like aphis on her disc as she sits there a tiny monument to her tiny self, forms an exceedingly pretty object for the microscope under a two-inch objective. Here is an epitaph for her.

> "Praises on tombs are trifles idly spent;
> A fly's own self is her best monument."

Let me add that this is a true aphis, milk tubes and all, and not a coccus. I would ask one more question concerning some eggs which I find on the sycamore leaf. They resemble those of the lace-winged fly, but instead of occurring singly there are about a dozen on as many pedicels which combine into a single stem about ¾ of an inch in length, and this is again divided into as many rootlets, which are cunningly fastened to the leaf. To any kindly-disposed entomologist I would say R.S.V.P.—*T. E. A.*, *Diss.*

BOTANY.

THE WHITE FLOWER QUESTION. Will Mr. Davy, the author of the delightfully impartial and non-faddist paper in the September number, page 211, kindly answer the following queries relative to the above subject:—1. In the Cornish districts which are inordinately prolific in the way of white variations, does the heather bloom early or late as compared with that growing further north:—2. Is the atmosphere of the said regions unduly moist, or possibly charged with saline substances wafted invisibly over from the adjacent ocean.—*P. Q. Keegan.*

EXTRAORDINARY GROWTH OF WILD ROSE HIPS.—A short time ago a most interesting example was brought before my notice of a wild rose hip, the extraordinary size of which, together with its general appearance, not only beat that of any I had ever seen before, but completely astonished me. So strange did this fruit appear that I think it worth while to bring a brief description of it before the readers of SCIENCE-GOSSIP, in the hopes that some one may be

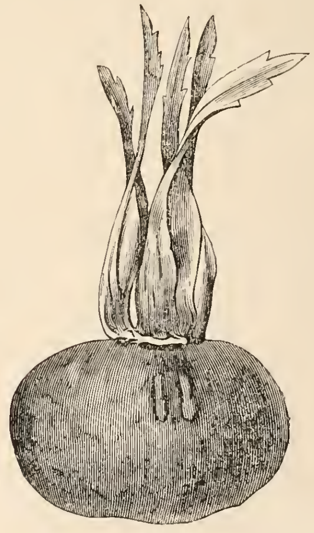

Fig. 197.—Abnormal growth of Rose Hip.

able to give me some reason for such an unusually enormous structure. The hip in question was one of two that a gardener, belonging to the premises in which I was staying, brought me to see from the estate of Lord Bramwell at Four Elms, Kent. Both of the hips were large, but the one the man gave me to keep was by far the better of the two; so of that one alone I mean to speak. In general appearance the fruit might easily have been likened to a ripe tomato, so far as its colour and texture were concerned, for it was of the most brilliant orange red, and of a very succulent texture. A closer look, however, showed that it was veritably and indeed a hip. From the centre of the fruit, on its upper surface, rose the remains of the five sepals (the length of which was an inch and a quarter), within which lay a mass of dead stamens, some of which showed the last remnants of their anthers, shrivelled, and of a pale brown colour, still resting on the filaments. Below these calyx-remains lay the hip itself, the circumference of which measured four inches; the depth, three quarters of an inch, measuring from the base of the sepals to the point of juncture of the hip and the stalk. The shape was more that of an ellipse than anything else; the surface smooth and shiny, the colour an extremely rich orange red. Comparing this with an ordinarily large hip, its magnitude strikes one as being really marvellous, and I shall feel only too glad if any reader can afford me any reason for such an unusual growth. Can it be that soil causes it? That Nature plays no "freak" with this rose-bush is proved by the fact that every year a few hips, of an equally large size, are found on it. The bloom of the plant is very large, single, and either white or very pale pink in colour, and the bush grows naturally close to the kitchen-garden on the above estate. I made all enquiries I could about the plant, and was told it was a genuine wild rose which had grown in that spot, and developed this great size of bloom and fruit naturally. This year there are but a few hips on the plant. Such a structure has interested me keenly, and I close this brief account of it with the express hope that others may be interested in hearing of it as well; and any information as to whether such hips have been seen before or not will be most gladly received.—*K. E. Styan.*

THE COMMON TEASEL.—Just outside the window of my sitting-room is a plant not often seen, I think, in a semi-suburban garden-bed. It is a tall and shapely common teasel. It came of its own sweet will, and has been left to grow as it liked, until some forty blossom-heads have girdled themselves with mauve flowers whose circles, starting midway round the dense spike, retreat upwards and downwards in the oddest fashion, giving an effect not easily described. I do not know whether anyone has explained this curious mode of flowering of the teasel. Nor is this the only problem the plant presents to the botanist. What special merit is there in the flowers which should cause them to be guarded like an eastern monarch's harem, or like the Emperor of China, or the Lama of Thibet? First, the whole plant is more or less covered with prickles, not very sharp, but quite sufficiently disagreeable to ward off the bite of a sheep or cow, one would think. Secondly, the spikes bristle with spiny bracts, projecting so far beyond the flowers that the only insects which dare to alight are humble-bees, of which at least two or three may be seen travelling systematically round and round the flower circles. They are of two kinds. I am no entomologist, so cannot give their names, but one, the rarer, is small and brown, the other black with red tail. The large golden-banded humble-bee does not seem to visit the teasel at all, though I do not see why it should find more difficulty in getting honey from the flowers than its smaller relatives. Lastly, the conformation of the leaves offers an efficient protection against ants and other small insects which might scale the stem and rob the sweets reserved for the humble-bee. The pairs of opposite leaves are connate, *i.e.*, their blades unite, base to base, forming little basins which contain rain-water even in dry weather. As a child, I always thought they were specially provided to give drink to the wee birds in summer-time; I do not think so now, but I am just as sure that they do not take this shape by accident, that these reservoirs benefit the plant in some way, probably by the exclusion of noxious insects. Possibly, like the sundew, the plant may also benefit by the death of drowned intruders, but I have made no observations on this point. A slight change in the shape of the plant's defensive armour, the curving of the bracts, has made one of its cultivated varieties of great use to cloth-weavers. Cloth-making, helped no doubt by the layers of fuller's-earth found beneath the soil of this district, was formerly a staple manufacture, but none is now made, and the fuller's-teasel has disappeared from the neighbourhood, if, indeed, it was ever cultivated, and the common teasel seems to have no rival in the hedgerows and thickets, where it rears its spiny heads in defiance of wind and weather until autumn has withered their bracts and scattered their seeds, and then they find way into winter bouquets and bird-stuffers' "landscapes," and so renew, if not their youth, at least their usefulness, to some people's way of thinking. But the dead brown stalks and prickly heads will never, to my mind, do more than suggest the delicate tints and quaint conceits of the plant in full bloom.—*M. E. Pope.*

VERONICA CHAMŒDRYS.—I find the upper leaves of the germander speedwell have been aborted and unnaturally developed by a small red grub. Will any correspondent interested in such matters let me know its scientific name and life-history. I enclose specimens, which I fear will be of very little use when they reach you.—*E. Adrian Woodruffe-Peacock, Cadney Vicarage, Brigg.*

BACTERIA AS FEEDERS OF LEGUMINOUS PLANTS.—At a recent meeting of the Alford Field Club and Scientific Society, Mr. William Wilson, Alford, N.B., dwelt upon investigations on the above. After touching upon the investigations and opinions of Malpighi, Treviranus, A. P. De Candolle, Erikson, Frank and Ward, he entered into the conclusion of

Hellriegel, which had now been generally accepted, viz., that the bacteria possessed the power of absorbing free nitrogen to feed the plants; and explained certain experiments which he saw conducted at Rothamsted to test this view, which experiments made him entertain the idea that it was correct. The next point touched upon was an experiment which he was conducting with an improved Lathyrus (*L. sylvestris*, Wagn.). Great results were claimed by Dr. Wagner, the improver of the plant, from *Lathyrus sylvestris* (Linn.); but the experiment, along with others in Britain, had been practically a failure. The grounds of the improvement rested on the great power of the plant to absorb nitrogen as mentioned. The failure of the plant in this climate led him to inquire into the matter and to compare investigations which he had made on native leguminous plants regarding the Bacteria. It appears that the plants produce, or Bacteria is produced, in best form where the plants are growing under favourable conditions for their development, thus assisting prolific development and not extension of geographical area, as is the case with bulbs and creepers on grasses, etc. This was partly confirmed from observations taken from the broom and needle-greenweed, and on a very prolific dwarf pea, which produced a great development of Bacteria, as well as coinciding with results gained at Rothamsted, where a cultivated plant did not produce Bacteria on arid soil, but when garden humus was added Bacteria was produced.

To Lincolnshire Botanists.—We have pleasure in inserting the following letter:—"I am busy collecting materials for a 'Flora of Lincolnshire.' Would you put a notice in your widely-read paper to say I shall be most happy to receive voucher specimens, with localities, dates, &c., for any of our less common or rare plants. Unless I am dealing with past-masters, mere lists are of little use, though thankfully received."—*E. Adrian Woodruffe-Peacock, Cadney Vicarage, Brigg.*

NOTES AND QUERIES.

"Sea-Fowling."—I was both surprised and sorry to see the letter signed, "Sea-Fowler" last month, and I would fain hope that this gentleman's notion of the way to spend a "happy Saturday" will not commend itself to many of your readers. When he tells with evident glee that one gunner shot twenty-seven dozen and five harmless birds at one shot, the feeling in the minds of most persons will hardly be one of admiration, but rather of deep disgust, especially when it is remembered that in addition to the number of birds killed, many more must have got away wounded, to die a lingering and painful death. When I read his description of how he shot one of those noble birds, a wild swan, and wounded another which got away and was caught (evidently still alive) next day, I did not wish this self-complacent gentleman any harm, at least not much, but I could not help thinking that if he had lain helpless through a long frosty winter's night with a gunshot wound, and a broken limb, he would look upon his pleasant day's sport, as he calls it, in a different light. I suppose there will always be a certain number of persons who find their pleasure in killing for killing's sake, but they should not be encouraged to make a boast of it.—*W. Ward, Southampton.*

Cleaning Varnish.—Can you, or any of your readers, tell me of a good method of cleaning the balsam, asphalte varnish, etc., off spoiled microscope slides, in order to use the glass slips again? I find it a very slow process scraping them clean one by one.—*A. Verinder.*

Optical Effect, Science Gossip for August, p. 188.—The optical effect described by H. J. T. is well known as "Purkinje's figures" (see Huxley's Elementary Lessons in Physiology). It is not quite easy to understand without some knowledge of the anatomy of the eye, but, briefly, is due to this: the optic nerve, which enters the eyeball at the back (like the stalk of an apple), spreads out over the back of the eye into a delicate nervous layer, the retina. Minute blood-vessels enter the eye at the same spot, and ramify over the inner surface of the retina. When a beam of light is thrown very obliquely into the eye (as H. J. T. describes), these branching blood-vessels are seen, by means of the retina behind them.—*M. E. Pope.*

Snakes and Parasites.—There are several species of ticks parasitic on snakes, but it would be impossible to identify them from Mr. Tilly's note. Judging from his description, the insects found on the sloughs, may, I think, be mites so often found to be troublesome to cage-birds when due attention is not given to the cleanliness of the cages.—*J. Macnaught Campbell.*

Floral Guide to Kent.—Will some one tell M. B. W. by whom Cowell's "Floral Guide to E. Kent is published, and also the price of the same? It was mentioned by "Ede" under the heading "Flora of Kent" in the May number of Science Gossip.—*M. B. Wigan.*

The White-flower Question.—A London reader of Science-Gossip sends me a very interesting letter on this subject. He speaks of having found in North Wales, last autumn, *Gentiana amarella* and the plume thistle both bearing pure white flowers. *Symphytium officinale*, which I spoke of last month as occasionally bearing white flowers in this neighbourhood, he mentions as growing around Bath much more frequently than the purple variety. In Switzerland and the south of France he has met the lesser periwinkle bearing blue, red, and white flowers, all growing together. The most important part of this letter relates a curious experience with three plants of *Campanula latifolia* someone had given him bearing pink bells. He planted all three in his garden, and at the end of the season carefully saved the seed they had produced. From these he had, the following year, plants bearing white, light and dark blue flowers, and only just one or two plants with pink ones. Since then he has grown all shades and varieties of colour, but never since the first seed sowing any pink. To all these interesting remarks he adds that he has more than once found *Anthyllis vulneraria* bearing white flowers. I, too, have found this plant with white flowers, but only very sparingly. Besides those plants mentioned last month as sporting into white I have found:—*Vinca minor*, *Stachys betonica*, *Stachys ambigua*, *Scilla nutans*, and *Luzula campestris*.—*Fred. H. Davey.*

CURIOUS PHENOMENON AMONG ROOKS.—The remarks in last month's SCIENCE GOSSIP on mortality among rooks during the past winter, recalls a curious phenomenon which occurred in this neighbourhood about six years ago among a colony of the same birds. The rookery in question contained at its most flourishing state, from thirty to forty-five nests. During the spring of 1886, the birds commenced nesting operations in season, and by the middle of March most of the ill-constructed domiciles had approached completion. But one morning (I think it was March 26th) a painful surprise awaited the proprietor of the estate. Not a caw or sound from the sable tenants of the tall elms and ash broke in on his matutinal slumbers, and on proceeding outdoors he found his feathered friends had taken their flight. By some unaccountable means they had suddenly awoke to the fact that they possessed wings. As though the place was under a ban, the whole race of crows kept clear of it. Until the spring of 1889 were the old haunts thus deserted, and then, as if by a preconcerted plan, one morning a score of the noisy birds alighted on the tree-tops with much clattering and ado. They held what seemed to be a conference of some kind. Chattering, flitting from branch to branch and tree to tree, and a series of graceful gyrations over the tree-tops continued until noon, when the proprietor had the joy of seeing the foundations of a new colony being laid. To-day the rookery is in a thriving condition, not containing so many tenants, it is true, as the one that existed there prior to 1886, but at the same time running it very close.—*Fred. H. Davey.*

LARGE FUNGI.—The following is an account of large growths of two fungi. A specimen of *Lycoperdon giganteum* which I found at Kew (1889), was 11 inches long, and weighed 36 ounces; another of the same I found at Hampstead this year was 8 inches in diameter, 22½ in circumference and weighing 23½ ounces. A very large fungus was that of *Phallus impudicus*, which was 9¾ inches high, pileus 2 inches long, and stipe 1½ inches in diameter. This I found in a copse at Highgate.—*Henry E. Griset.*

INDIAN LIZARDS.—When I was a lad I had a collection of Indian stories, I think the name of the author was Addison. In it there was a statement to the effect that the common house-lizard, if it happens to run over the skin, emits an acrid liquid which causes a burning sensation and raises a blister. Now, I have been in the North-West Provinces of India for over eight years and must have caught and handled at least 200 house-lizards, and I have never found one which emitted any liquid whatever; more than that, at one time a semi-tame lizard lived on my bedstead, and repeatedly awakened me by running over my face after mosquitoes, with no result. I should be glad to know, therefore, if the statement is entirely mythical, or true for *any* sort of lizard.—*J. R. Holt.*

REMARKABLE HEN'S EGG.—In reply to your July correspondent who enquires as to curious contents of hens' eggs, I may say that I have just seen something far more curious than a pin inside of one, viz:—a fleshy substance very nearly resembling a heart in shape. The egg containing it was laid by a blue Andalusian hen belonging to Mr. E. Childs, No. 11 North Parade, Allerton, Bradford, on the 6th of March last, and weighed. when whole, 4½ ounces. It contained both white and yolk beside the heart. The hen is a last year's pullet, is perfectly healthy and has reared two broods since laying the abnormal egg. When the egg was found a string or vein of the heart-like object was protruding through the thick end, and the egg was broken open in the presence of several witnesses, including a medical gentleman. It is now preserved in spirits of wine, and can be seen at the above address, and I should like some of your readers to explain it.—*Jesse Mitchell.*

A COUNTING CHIMPANZEE.—The Zoological Gardens have sustained a serious bereavement in the death of "Sally," the black-faced chimpanzee from the west coast of Gaboon, who for eight years has entertained many thousands of folk of all ages, and of both sexes, at the popular gardens in Regent's Park. The intelligent "Sally" has been the subject of comment amongst men of science, of sages and philosophers, and possibly theologians. Perhaps the most remarkable of her feats was that of counting. "Sally," in the presence of a crowded room, when called upon, say for bits of straw in her cage, would give you the exact number you named, up to ten, and the keeper has found her, when alone, count in this way up to twenty. If one of the public asked for five, six, or nine straws, or whatever quantity up to ten, she would pick each deliberately up, without any mistake, put one by one in her mouth until all were got together, and then give them into your hand. If asked for a "button-hole," she would take a straw, break off part of the stalk, and put the ear into the button-hole of the keeper's coat. She knew right from left; would use a spoon, and sip with it until the cup was empty. She was four years old when first brought to this country, and was therefore twelve years of age.

POISON IN LABURNUM SEEDS.—At Birmingham seven children were taken to Queen's Hospital suffering from the effects of having eaten seeds taken from the pods of a laburnum tree. They each showed symptoms of poisoning, and emetics had to be administered. Two of them were so ill that they had to be detained. The children had been playing in the churchyard at St. James's Church, Edgbaston, and had picked the pods from a laburnum tree and eaten them, not knowing that they were injurious.

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

R. H. JAPP.—Apply to Mr. J. King, Seahorse House, Portland Road, London; or Mr. A. J. R. Sclater, Teignmouth, Devon.

A GENERALISED INDEX.—It is very pleasant to find how deeply our numerous readers are interested in the subject of another General Index. We are aware the vols. of SCIENCE-GOSSIP for the last twenty-five years are the best Cyclopædia of Natural History in the world.

D. H. STUART STEWART.—The specimen you sent us of the abnormal var. of the white willow (*Salix alba*) was very interesting, and we are much obliged to you for it.

D. H. S. S.—"Spiritualism" and "Mesmerism" hardly come within the scope of SCIENCE-GOSSIP; but we think the Secretary of the London Spiritualist Society would supply you, if asked, with a list of the best books on those subjects.

F. H. P. COSTE.—Your letter must someway have gone wrong, for we have not received it. Please send us your paper.

W. WILSON.—Thanks for your notes. We will look them up.

EXCHANGES.

I HAVE twenty-two birds' eggs (various) for exchange. Wanted, fossils from any formation except carboniferous.—Walter C. Shields, 30 Garturk Street, Crosshill, Glasgow.

DUPLICATE clutches of curlew, shieldrake, carrion crow, ring ouzel, b. h. gull, sandpiper, snipe, jackdaw, magpie, tree pipit; eggs of bittern, teal, ptarmigan, &c., side-blown. Wanted, clutches, side-blown and with data, numerous sorts. —F. W. Paple, 62 Waterloo Street, Bolton.

FOSSILS from Barton clay, Purbeck limestone, Kimmeridge clay, and Portland oolite, offered in exchange for those of other localities, rocks, minerals, &c. Apply—A. E. Salter, 8 Venetia Road, Finsbury Park, London, N.

OFFERED, *Alycœus sculptilis, Hydrocœna Blanfordiana, Hybocystis gravida, Pupina artata, Diplommatina angulata, Cyclophorus speciosa, Otopoma clausum, Assiminea Francesiæ, Bithynia marginata, Paludomus regulata, Paludina heliciformis, P. doliarus, Melania lirata, M. tuberculata, Clausilia insignis*, from India. Offers wanted in mitra, marginella, or rare land shells.—Miss Linter, Arragon Close, Twickenham.

WANTED, foreign beetles, set or unset, in exchange for many species of British land and freshwater shells, lepidoptera, or good foreign postage stamps.—Mrs. Smith, Monmouth House, Monmouth Street, Topsham, South Devon.

Planorbis corneus, var. *albida, Zonites excavatus*, var. *vitrina, Unio pectorum, Vertigo pygmæa*. Wanted, foreign land or freshwater shells, or rare British.—William Moss, 13 Milton Place, Ashton-under-Lyne.

NUMEROUS Ceylon shells, also fifty 1½-inch corked glass tubes for exchange. Wanted, foreign shells. Please send lists.—J. E. Cooper, 93 Southwood Lane, Highgate, N.

WANTED, various species of British vertigos. Good exchange in other species and varieties of British land and freshwater shells.—E. W. Swanton, Doddington, Sittingbourne.

OFFERED, a mounted and labelled collection of about thirty British land and freshwater shells, in exchange for British birds' eggs not in collection. Full list given on application.—E. W. Swanton, Doddington, Sittingbourne.

OFFERED, *Donax scortum, Helicon pectinata, Siphonaria concinna, Trochus impervius*, from Port Elizabeth. What offers in British marine, land and freshwater, and foreign shells not in collection?—Mrs. Heitland, The Priory, Shrewsbury.

QUADRANT tandem tricycle, No. 15, balls, dress-guards, accessories complete. Will exchange for superior microscope. —Kirk, 20 Lombard Street, West Bromwich.

MICROSCOPE, Beck's star, two eye-pieces, 1, ¼, and ⅛ correction objectives, double nose-piece, air-pump for mounting objects, Carpenter's "Microscope," and several other books, together or separate. Engineering books wanted.—Taylor, 26 Marchmont Street, London, W.C.

WOULD anyone having duplicate natural history specimens or curiosities to spare, towards the formation of a small school museum, kindly communicate with—J. A. Ellis, 1 Pomona Place, Fulham, London, S.W.

OFFERED, Wood's "Insects at Home," and Stainton's "Manual of British Butterflies and Moths," 2 vols., both equal to new, published at 10*s*. 6*d*. each.—H. Baker-Browne, Sherrington House, St. Philip's Road, Norwich.

Zonites excavatus, var. *vitrina, An. lacustris, Lim. glabra, Hel. ericetorum*, vars. *instabilis* and *leucozona, Bul. acutus*, and vars. *bizona, strigata*, and *articulata*. What offers in other shells for the above?—R. Cairns, Queen Street, Hurst, Ashton-under-Lyne.

DUPLICATES of the following numbers, 8th edition London Catalogue: 39, 46, 100, 147*b*, 161, 229, 286, 317, 379, 475, 483, 486, 487, 536, 543, 552, 562, 698, 917, 944, 1239, 1584, 1663, 1688, and others, for which I would exchange, in equal number, plants locally abundant not occurring in Yorkshire, or offers.—J. Beanland, 7 Oastler Road, Shipley, Yorks.

I CAN send rare British shells in return for good mounts of rocks and diatoms, or natural history specimens.—T. E. Sclater, Bank Street, Teignmouth.

ABOUT 1500 herbarium specimens of plants and grasses, chiefly British and Continental, but many from N. America, Asia, China, Australia, Siberia, &c., to exchange for an eight or ten-drawer insect cabinet. Fuller particulars on application to R. Standen, 40 Palmerston Street, Moss Side, Manchester.

FOR exchange, rare birds' eggs, single or in clutches. Wanted, guillemots, razorbills, gannet, cormorant, skylark, pied wagtail, warblers, tits, hawks, swift, martin, wren, &c.—Jas. Ellison, Steeton, Keighley, Yorks.

Avicula hirundo, Isocardia cor, Mangelia striolata, wanted in return for rare British and foreign shells, geological specimens. Mutual exchange.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTED, *Planorbis lineatus, Pl. nitidus, Pl. nautileus, Pl. parvus, Pl. spirorbis, Pl. complanatus, Physa hypnorum, Limnæa glutinosa, L. involuta, L. truncatula, Paludina contecta*, and other freshwater or land shells not in collection, in exchange for *Unio tumidus, Sphærium corneum, Pisidium amnicum, Planorbis carinatus, Limnæa auricularia, Limnæa glabra, Ancylus fluviatilis, A. lacustris, Clausilia rugosa, Cl. rugosa*, var. *dubia, Cl. laminata, Helix virgata, H. hortensis, H. nemoralis, H. pulchella, H. rufescens*, and others.—R. D. Laurie, 94 Woodchurch Lane, Birkenhead.

OFFERED, chiton, scabridus, and other shells. Wanted, British shells not in collection. Foreign correspondence invited.—E. R. Sykes, 13 Doughty Street, London, W.C.

DUPLICATES.—*H. nemoralis, hortensis, arbustorum, lapicida, Coch. tridens, Claus. laminata, Vertigo pygmæa*, &c. Desiderata, land, freshwater and marine shells, and fossils from various formations.—H. E. Craven, Matlock Bridge.

DUPLICATES of *H. aspersa, nemoralis, hortensis, Pisana virgata, caperata*, &c., from County Dublin, offered; other species collected if required. Lists exchanged. Correspondence invited.—J. Roland Redding, 4 Vincent Terrace, Glasneivin, Co. Dublin.

WANTED, fossils from various localities, particularly British and foreign tertiaries. A large number of good duplicates offered in exchange.—Thomas W. Reader, 171 Hemingford Road, Barnsbury, London, N.

OFFERED, microscope slides—anatomical, botanical, insects, diatoms, &c., also unmounted foraminiferous material; also "Fungi," by Cook, and a few other books. Wanted, slides of rocks, or rock specimens (igneous and metamorphic only), or books on geology, mineralogy, vulcanology, or seismology.—R. S. Stephens, 25 Fondwych Road, West Hampstead, London, N.W.

WILL exchange a photographic enlarging lantern in thorough working order, also minerals, fossils, shells, botanical specimens, &c., for foreign stamps or cash.—F. Cartwright, 20 Eldon Street, C.-on-M., Manchester.

"Review of Reviews," and "Strand Magazine" from commencement (twenty numbers of former, eight of latter), the "Universal" edition of Shakspeare, also the following paper bound editions:—Kingsley's "Westward Ho!" "Hypatia," "Yeast," Lubbock's "Pleasures of Life" (2 vols.), Scott's "Ivanhoe." What offers in books on Christian evidences, stories by J. M. Barrie, &c.?—W. H. T., 76 Clifton Street, Lytham.

Unio margaritifer and other British and foreign shells for exchange. Send lists to Mrs. Carphin, 1 Lauriston Park, Edinburgh.

DUPLICATES.—*H. fusca, lamellata, Pupa ringens*, &c. Desiderata, *Limnæa involuta, Succinea virescens* and *oblonga, Helix revelata* and *obvoluta, Vertigo Lilljeborgi* and *Moulinsiana, Acme lineata*, and any albine varieties not in collection.—T. A. Lofthouse, 67 Grange Road, Middlesbrough.

BOOKS, ETC., RECEIVED FOR NOTICE.

Vols. of the Smithsonian Institution for 1887-89.—"Stammering; Its Nature and Treatment," by Emil Behnke (London: T. Fisher Unwin).—"Le Diatomiste," No. 6 (September) (London: Baillière, Cox & Co.).—"An Account of British Flies (Diptera)," part i. vol. i.—"The Asclepiad."—"Quekett Journal."—"Journal of the Geologists' Association."—"Proceedings of the Bristol Naturalists' Society."—"Key to the Genera and Species of British Mosses," by the Rev. H. G. Jameson, M.A. (London: West, Newman & Co.). —"The International Journal of Microscopy and Natural Science" (September).—"The Essex Naturalist."—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Journal and Proceedings of the Royal Society of New South Wales," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: W. R.—J. M.—W. C. S.—J. H. G.—J. J. A.—J. C.—W. F. C.—A. F.—R. B.—K. E. S.—A. S.—R. M.—F. S. M. J. H. P. C.—A. B.—G. C.—S. A. C.—T. G.—W. W.—E. W. S.—E. A.—T.—W. C.—J. R. H.—W. M.—H. E. G.—J. E. C.—H. F.—M. E. P.—W. H. Y.—F. W. P.—A. E. S.—L. J. S.—J. E. L.—H. C. M.—C. W.—G. S. V.—H.—J. P. N.—E. R. S.—F. H. D.—R. D. L.—J. E.—H. E. C.—A. J. R. S.—T. E. S.—D. B.—J. R. R.—T. W. R.—R. S. S. —R. S.—J. B.—P. Q. K.—R. H. Y.—W. H. T.—R. C.—E. P.—H. B. B.—J. A. E.—C. P.—W. E. C.—V. C.—A. G. T. —T. E. A.—W. S.—&c., &c.

NEO-DARWINISM.

By A. G. TANSLEY.

II.—The Problem of Heredity.

THE general phenomena of heredity are well known. Not only do specific characters reappear with absolute accuracy in every generation, but those slight "individual differences," which characterise the various individual members of any species are also very frequently transmitted to the descendants of the members in which they first appeared, for more or fewer generations, and with greater or less intensity. In the human race the curved nose of the Bourbons, and the projecting chin of the Hapsburgs are examples which are known to all; and everyone can multiply instances to any extent from his own personal experience. How are we to account for these wonderful facts? It is sometimes said that they are accounted for by a law of persistence, that "like produces like." But this is no real solution at all, it is merely a restatement of the problem. The first step in a real solution is to recognise that in ordinary cases of reproduction, a single cell is separated from the body of the parent, that it subsequently divides and redivides,* and that by the growth and differentiation of the products of its division, it is developed into the body of the offspring. These are ascertained facts, and form the only secure foundation for further investigation. Now come the questions, how is it posssible for a single cell, often not more than $\frac{1}{150}$ inch in diameter, to contain all the complex potentialities of the body of one of the higher animals or plants? How does it come to possess these potentialities? and lastly, how is the adult organism developed from the cell containing them? These are the real problems of heredity, which we have to attempt to solve. In the present state of science it is impossible to furnish definite answers to these questions in terms of ultimate physical and chemical forces. Nevertheless we can arrive at some conceptions of the *modus operandi* of hereditary transmission from a biological point of view. We must premise that the first question is the most difficult of all. We know that the tiny cell, often invisible to the naked eye, actually does contain these potentialities, but it is only in the vaguest manner that we can conceive *how* they are contained in its molecular structure. The second question embodies the problem of the transmission of hereditary tendencies from one generation to another; this we shall call shortly the "problem of transmission." The third question embodies the problem of the development of the hereditary tendencies contained in the germ-cell into the actual features of the organism. This we may call the "problem of development." These two problems are distinct, and should not be confused, although they are intimately connected. A complete theory of heredity must furnish a solution of both.

We must now consider the chief attempts at solution which have from time to time been made by various biologists. In chronological order they stand thus:—

1. Mr. Herbert Spencer's theory of "physiological units" ("Principles of Biology," vol. i. 1863).

* The process of fertilisation, which in the vast majority of cases precedes segmentation, is here purposely left out of account to avoid complicating the statement of the problem. The statement is only *literally* true in cases of parthenogenesis.

2. Mr. Darwin's "Provisional hypothesis of Pangenesis" ("Variation of Animals and Plants under Domestication," vol. ii. 1868).

3. Mr. Francis Galton's "stirp" and "gemmule" theory, ("Proc. Roy. Soc.," No. 136, 1872, and "Journ. Anthrop. Inst.," vol. v. 1876).

4. Professor Häckel's "Perigenesis of a Plastidule" ("Ueber de Wellenzeugung der Lebenstheilchen," 1876).

5. Professor Nägeli's "idioplasm" and "germ" theory ("Mechanisch-physiologische Theorie der Abstammungslehre," 1884).

6. Professor Weismann's theory of the "Continuity of the Germ plasm" (1885).

This does not profess to be a complete list of theories of heredity, but it contains the most representative and important contributions to the subject.

Mr. Herbert Spencer's and Professor Häckel's theories (which are practically identical) must however be treated separately from the rest. These two authors aim at arriving at general conceptions about the nature of the qualities possessed by the bearers of hereditary tendencies which *enable* the latter to build up an organism like the parent. They do not give us any particular and definite information on either the *process* of transmission or the *process* of development: and hence their hypotheses do not admit of the analysis indicated above.

Mr. Spencer supposes the existence of certain "physiological units," * of which the protoplasm of a cell is composed. They are the ultimate biological units, just as the molecule is the ultimate physical unit, and the atom the ultimate chemical unit. They possess "polarities" which cause them to build up an organism of a definite shape, just as the polarities of the molecules of a crystal cause the latter to build up a crystal of a definite shape. They are made up of, and are immensely more complex than, the molecules of the chemical substances of which protoplasm is composed, and "in each organism the physiological units produced by this further compounding of highly compound atoms [molecules] have a more or less distinctive character.† We must conclude that in each case, some slight difference of composition in these units, leading to some slight difference in their mutual play of forces, produces a difference in the form which the aggregate of them assumes." ‡ The sperm-cells and egg-cells are simply "vehicles in which are contained small groups of the physiological units in a fit state for obeying their proclivity towards the structural arrangement of the species they belong to." § Any modification of the function or structure of any part of an organism will cause, "some corresponding modification" of "the structures and polarities of its units." These modified polarities will tend to re-establish equilibrium between the forces of the aggregate and those of the unit, and hence separated groups of units will tend to build up an organism modified in a similar manner to the one from which they were derived. Thus does Mr. Spencer attempt to give us a conception of the manner in which he imagines both ordinary inheritance and also the inheritance of acquired modification, can take place.

Professor Häckel substitutes "plastidule" for "physiological unit," and "vibrations" or "undulatory movements" for "polarities"; but apart from these changes of terminology, his hypothesis appears to be substantially the same as that of Mr. Spencer, which, however, he seems not to have read.*

Various criticisms can be obviously made. In the first place a living organism is not a crystal, nor do its ultimate living constituents—call them physiological units or protoplasmic molecules or what you will—act in an exactly similar way to the molecules of the latter; and although Mr. Spencer carefully avoids stating that they do, this is what he practically assumes in his explanation of normal heredity and the repair of lost parts. But he also states that a modification of structure or function causes modified structure and polarities of the physiological units, and that in consequence separated groups of the latter build up a similarly modified organism. But if this is sometimes the case, why is there no hereditary effect in the case of the loss of those parts of organisms which are normally repaired? such as the leg of a newt, or the tail of a lizard or of a tadpole. There is surely a sufficient modification here to "impress some corresponding modification on the structures and polarities" of the physiological units. And on the former assumption, why are lost parts not always repaired? Why does not a man grow a new leg when he has lost one? Where is the difference between the two sets of cases? It has never (on Mr. Spencer's theory) been pointed out. As a matter of fact, the two explanations are mutually exclusive. And even supposing they were not, they both depend upon the unjustifiable assumption of absolute solidarity between the parts of an organism. No doubt the relations of the different parts of the body to each other and to the whole are highly important, but it is impossible to maintain that a slight modification of any given part *necessarily* affects permanently every other part; and this is what Mr. Spencer's assumption practically amounts to. And we have never been furnished with a clear and definite account of the mechanism by which the effects of such modifications are propagated through the body to distant cells—cells, too, which are often fully developed and have become perfectly quiescent years before. This

* Professor Michael Foster ("Text-Book of Physiology," fifth edition, Introduction, pp. 5, 6) has adopted this conception in order to explain the facts of metabolism, and the differences of different tissues. He differs from Mr. Spencer in this last part of the hypothesis.

† Cf. the "idioplasm" of Nägeli.

‡ "Principles of Biology," vol. i. p. 183.

§ Ibid. p. 254.

* I am not acquainted with Professor Häckel's hypothesis at first hand.

is a difficulty which Professor Ray Lankester expressed so long ago as 1876, when contrasting Mr. Spencer's theory with that of Pangenesis.* And now we are certainly entitled to go further, and to enquire why the effects of constantly performed mutilations, *which are not repaired*, do not tend to become inherited after many generations, as they certainly ought to be on Mr. Spencer's theory. Finally we ask—and ask in vain—for an explanation of the fundamental facts of atavism.†

Mr. Darwin's "Provisional Hypothesis of Pangenesis" differs very fundamentally from the theory we have been hitherto considering. It distinctly recognises the necessity of grappling with the two questions which we have seen to be the fundamental problems of heredity—the problems of transmission and of development—and it answers these questions in a clear and unmistakable manner.

Mr. Darwin supposes certain organic particles called *gemmules* to be the specific bearers of hereditary tendencies. These are continually—at all stages of development—being given off by every cell in the body. The gemmules are continually circulating throughout the body, and finally collect in the reproductive cells. Each gemmule is a representative of the cell from which it took its origin (*at that period of its life-history*), and is capable, under proper conditions, of developing into a similar cell. The germ-cells, then, being simply collections of such gemmules, possess the potentialities of new organisms exactly similar to the old.‡ This is Mr. Darwin's solution of the problem of transmission. The problem of development he solves as follows. The gemmules representing any given stage of development have a special affinity for the partially-developed cells of the stage immediately preceding. They seek out and unite with these, and are thus able to develop in the right order their corresponding parts. This extremely ingenious suggestion Mr. Darwin supports by reference to the unerring accuracy with which pollen of the right species alone develops pollen-tubes when a number of different kinds are placed on the stigma of a flower.

The phenomena of atavism, Mr. Darwin explains by supposing that some gemmules lie dormant for more or fewer generations, and suddenly, owing to especially favourable conditions, are enabled to develop into their corresponding structures.

It will be seen that this theory explains the problem of transmission mainly by the hypothesis of the *redevelopment* of new gemmules from the cells of the body into which the former gemmules were developed. It explains the problem of development, by supposing that there has been a *preformation** of distinct *germs of structure*, and that by means of the presence of these the germ-cell is able to produce the organism.

Mr. Darwin's theory explains with great readiness most of the observed abnormal phenomena of heredity, but it was to explain the supposed hereditary effects of use and disuse that it was especially constructed. This was indicated in the last paper (p. 210), and it was there pointed out that Mr. Darwin was right in his belief that a theory on the lines of Pangenesis would have to be ultimately adopted, *if acquired characters are inherited.* Its explanation of the problem of transmission by the assumption of the redevelopment of the gemmules from the cells of the body alone enables it to explain the hereditary transmission of the modifications acquired by those cells. The other theories of heredity which profess to allow of such transmission—such as Mr. Spencer's, depending on assumed absolute solidarity of the organism, or the late Professor Nägeli's, depending on cyclical development of idioplasm, which we shall consider presently—are open to even more serious and fundamental objections than is Pangenesis. We are, I think, in a position to say that if acquired characters are transmitted, a theory of heredity not essentially differing from Pangenesis will have to be adopted, and the difficulties—very great difficulties—attaching to it will have to be explained away somehow.

The theory of Pangenesis has been often and severely criticised; it is not my purpose to give a list of these criticisms here, but I shall consider three which seem to me to be of special importance. First, there is the argument about the inconceivable number of gemmules that must exist in the fertilised egg-cell

* "Advancement of Science," pp. 280–282.

† It is hardly fair to Mr. Spencer to charge him, as is so often done, with being too vague and general in his theory of heredity. In the first place, he is not in the least vague, and the impression that he is usually arises from failure to thoroughly understand his meaning. That his theory is "general," is true, as we have already insisted; but it should be remembered that he expressly says "a positive explanation is not to be expected in the present state of biology. We can look for nothing beyond a simplification of the problem." It is, however, quite open to us to criticise the theory on the ground of its being inconsistent with known facts; and further, to demand now a fuller and more special explanation of the phenomena of heredity, as the result of the many years of research which have elapsed since Mr. Spencer's words were written.

‡ "An organic being is a microcosm—a little universe, formed of a host of self-propagating organisms, inconceivably minute and numerous as the stars in heaven" ("Variation under Domestication," vol. ii. p. 399).

* Harvey, following Aristotle, enunciated the theory of *epigenesis*, to explain the process of development of the fertilised ovum into the adult organism. He believed that the various structures of the adult were formed by the successive differentiations of a relatively homogeneous rudiment (the fertilised ovum). Malpighi contradicted this on the ground of having directly observed the body of the chick in the egg during the early days of incubation. He unjustifiably assumed that it existed in the egg as a whole *before* incubation. Later on his views were taken up and extended by Bonnet and Haller, and became widely accepted. Bonnet, however, modified his doctrine in later life, and looked upon the egg as being only an "original preformation" of the body, not necessarily an actual miniature of the latter. C. F. Wolff, in 1759, entirely exploded the theory of "evolution," or "preformation" as generally understood, and re-established "epigenesis;" but Darwin in his theory of pangenesis undoubtedly revived the conception of the preformation of distinct germs of structure, though not, of course, the idea of a miniature organism in the ovum, but rather a conception akin to Bonnet's later views. It is in this modified sense that we use the word "preformation" and contrast it with pure "epigenesis," to which Professor Weismann has conspicuously retureed.

of, for instance, a mammal. This is an old objection to Pangenesis, and one to which Mr. Darwin replied by pointing to the enormous number of molecules which probably exist in a cubic millimetre of water. But when we consider, first that a gemmule is very much larger than even a very large molecule of a complex organic substance, and secondly try to get some conception of the enormous number of cells which will have to be represented, the objection appears of considerable force.

The second argument I propose to consider is that furnished by Mr. Francis Galton's and Professor Romanes' experiments on the transfusion of blood and transplantation of tissues in rabbits and guinea-pigs. Mr. Galton performed extensive experiments in transfusing the blood of distinct varieties of rabbits. He obtained no hereditary effect. Mr. Darwin would not admit that these experiments negatived the doctrine of Pangenesis. It was no essential part of his theory, he argued, that the gemmules should use the circulation as a means of transit. Obviously they could not do so in many of the lower animals and in plants. But in reply we may argue, with Professor Weismann, that it is difficult to see why the gemmules should fail to take advantage of so favourable a means of transit, and also how they could contrive to avoid it. Professor Romanes has since repeated these experiments with great care, and has also carried out very complete skin-transplantation experiments on guinea-pigs of distinct varieties, again with negative results. Now in this case, on the hypothesis of Pangenesis, a certain number of gemmules must have been present in the transplanted strips of skin, and how they failed to produce any effect is not at all clear.

Perhaps the most trenchant criticism of Pangenesis is Professor Weismann's, and it is best given in his own words. It is a criticism of Darwin's solution of the problem of development by the hypothesis of preformation. "One and the same part of the body must be represented in the germ or sperm-cell by many groups of gemmules, each group corresponding to a different stage of development; for if each part gives off gemmules, which ultimately produce that part in the offspring, it is clear that special gemmules must be given off for each stage in the development of the part, in order to reproduce that identical stage. . But the ontogeny of each part is in reality continuous, and is not composed of distinct and separate stages. We imagine these stages as existing in the continuous course of ontogeny; for here, as in all departments of nature, we make artificial divisions in order to render possible a general conception, and to gain fixed points in the continuous changes of form which have, in reality, occurred. Just as we distinguish a sequence of species in the course of phylogeny although only a gradual transition, not traversed by sharp lines of demarcation, has taken place, so also we speak of the stages of ontogeny, although we can never point out where any stage ends and another begins. To imagine that each single stage of a part is present in the germ, as a distinct group of gemmules, seems to me to be a childish idea, comparable to the belief that the skull of the young St. Lawrence exists at Madrid, while the adult skull is to be found in Rome. We are necessarily driven to such a conception if we assume that the transmission of acquired characters takes place."*

These three lines of argument show the heavy batteries which can be brought to bear against Pangenesis from various sides. We can hardly accept such a theory unless no other is possible.

Various attempts at modifying it have been made, of which, perhaps, the most important is Mr. W. K. Brooks'.† I shall not, however, discuss it here, but refer the reader who is interested in the matter to Professor Weismann's very complete criticism of it ("Essays on Heredity" pp. 326–332).

(*To be continued.*)

ROSSENDALE RHIZOPODS.

No. 6.

All the Rhizopods figured and described in my previous articles, have belonged to the sub-order Lobosa—having lobose, or finger-like pseudopodia, and containing many forms familiar to most microscopists. I have now to describe some less familiar Rhizopods, belonging to the sub-order Filosa. In this sub-order, the sarcode is not so obviously separable into a clear ectosarc and a more granular endosarc, but apparently consists wholly of the latter; and probably on this account the pseudopodia, instead of being lobate or finger-like, are in the form of exceedingly delicate, forked threads, which become finer and finer as they branch, and are usually more numerous than those of the lobose Rhizopods. The sub-order contains seven genera, five of which are represented in this district, and about seventeen species, some of which are beautiful objects, the tests being made up of round, or oval, over-lapping plates, arranged in such a way as to form definite patterns.

Pamphagus mutabilis, perhaps the most interesting species of the genus, I have not yet met with; but another species, *P. hyalinus*, is not uncommon in our clear ponds and wells, though from its minuteness and inconspicuous character, it may readily be overlooked. On a side view it is sub-spherical, and the lower end is produced into a short neck, with a circular mouth, through which the long, fine pseudopodia are protruded. As generally seen, it appears as a roundish granular mass, greyish in colour, occasionally with cloudy yellow patches in the interior, and in specimens from some localities

* "Essays on Heredity," pp. 316–317.
† "Law of Heredity," 1883.

diatoms and other minute algæ can be seen in various stages of digestion. The pseudopodia are excessively delicate, and require a nice adjustment both of focus and of the light, to clearly distinguish them. The artist has drawn the pseudopodia too dark. In all cases, the sarcode entirely fills up the delicate, membranous shell. The figures will show the general arrangement of the pseudopodia, which are almost constantly moving, though sluggishly, from side to side, or lengthening and shortening in the same slow, deliberate manner. A large nucleus is generally visible. My specimens were procured in great numbers, from the ooze of a clear pond. Although there was a constant though slow movement of the pseudopods, I never noticed any of the animals to move from

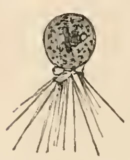

Fig. 198.—Pamphagus.

Fig. 199.—Pamphagus.

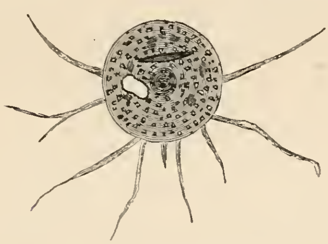

Fig. 200.—Pamphagus.

Fig. 201.—Pamphagus.

Fig. 202.—*Pseudodifflugia gracilis.*

the position in which they were first seen under the microscope; it is quite possible, however, that in summer they may show a greater activity in this respect. Like all other Rhizopods, they vary greatly in size, but the majority of my specimens averaged about the $\frac{1}{300}$ of an inch.

The genus Pseudodifflugia differs from Pamphagus only in the fact, that its chitinoid shell is incorporated or encrusted with sand-grains or dirt; in other words, it has the test of a Difflugia, but the delicate, filose, pseudopods of Pamphagus. There is only one species, *P. gracilis*, and in this the test is more or less void, with the mouth at the narrow pole; it is of various shades of brown, approaching to black. All my specimens were much more active than those of Pamphagus, among which they were numerous; indeed, many of them would have been quite overlooked, had it not been for the bobbing about of the shell, as they were so very much like an aggregation of flocculent dirt. I think it very probable that the form is much more common than supposed, but that its inconspicuous character causes it to be overlooked; or if seen, to be confounded with a minute Difflugia.

Fig. 198. Small specimen of *Pamphagus gracilis.*

Fig. 203.—*Cyphoderia ampulla.*

Fig. 204.—Cyphoderia.

Fig. 205.—Cyphoderia devouring Conferva.

Figs. 199 and 200. Larger forms with extended pseudopodia; sarcode granular with yellow patches.

Fig. 201. Side view of another, showing neck, and the extension of the pseudopodia through the mouth.

Fig. 202. *Pseudodifflugia gracilis*, with test of brownish dirt.

Cyphoderia ampulla is another Rhizopod, not uncommon in this district. I have found it in fair numbers in one clear pool, in several wells, and amongst Sphagnum; from the latter, the specimens have been larger, and, I think, more active. The test of Cyphoderia is very elegant from its graceful curves, and its minute pitting in all its varieties. It is generally of a straw-colour or pale yellow, occasionally colourless and transparent, of chitinoid membrane. It is a long oval, or retort-shaped shell, with a cylindrical neck curving down to the mouth. The fundus, or top of the shell is either evenly rounded, or drawn out in the form of a nipple-like prolongation. When the pseudopodia are extended, and the animal is moving, the mouth is directed downwards, and the body of the shell is directed backwards and upwards, as in Fig. 205. Many of the shells exhibit minutely hexagonal markings arranged in spiral rows; others seem, even under high magnification, entirely destitute of this; while in others again, the markings are so coarse as to appear pitted. I have frequently dipped from my marine aquarium, a Rhizopod in every point like the one described, so I presume this species is both lacustrine and marine. The sarcode does not ordinarily fill the shell, though this is sometimes the case. There is a large clear nucleus, generally visible and one or more contracting vesicles. The pseudopodia are long and delicate, often radiating from the mouth, for a distance equal or even exceeding the length of the shell, in fine, thread-like branches. There is considerable variation both in form and size; average specimens here are about $\frac{1}{200}$ of an inch in length, though I have seen others as small as the $\frac{1}{400}$ of an inch.

Fig. 203. Empty, colourless test, showing markings.

Fig. 204. Pale straw-coloured individual, with sarcode encrusted. No pits visible.

Fig. 205. Large yellow specimen, from Sphagnum, with no visible pitting, showing nucleus and contracting vesicle. Devouring a filament of conferva.

J. E. Lord.

Rawtenstall.

THE SPARROW IN 1891.

PERHAPS many will say after reading this paper, "What is the use of bothering about the sparrows? Kill them all!" Others will say "Very disgraceful taking sixty clutches of their eggs!" I say that sixty clutches are but a very small portion of those annually destroyed in this locality by those who consider them a pest. I have now for the sixth season paid considerable attention to their nidification and added another sixty clutches to my collection. They have not been collected, examined and prepared without considerable trouble, for which I have been duly rewarded by their revealing some facts which I believe have not been previously recorded.

They began nesting about the usual time, but in one locality they were quite ten days earlier than in another three miles distant.

Occasionally these birds produce some very beautiful clutches of eggs, but this season none of particular merit came to hand, except a clutch of six and a clutch of five. I give the measurement of the latter, as I have never known it equalled—it being quite the exception to meet with specimens fully an inch in length—1·0 by ·65—1·0 by ·65—·98 by ·62—·98 by ·65—·92 by ·65. The clutch of six—the only genuine clutch met with, which I have preserved—consists of exceedingly fine eggs, with the "odd egg" very pronounced. I must mention a clutch of five pygmean eggs, two being infertile. I think they would puzzle an old oological hand to recognize them. The eggs of this season were as a whole much more uniform in size than those of 1890. In that season many of the clutches contained a small but perfect egg, but this season this irregularity was quite exceptional. The smaller end marking only cropped up in one specimen, and that in the fourth clutch taken. I thought by its appearing so early in the season that more would be seen of it, but I have seen no further trace of it in any of the specimens brought under observation. There can be no doubt that the extreme rarity of these specimens is owing to the eggs being so large in proportion to the size of the birds.

Having examined such a large number of these eggs without meeting with anything like a double one, I began to think the sparrow to be quite exempt from this phenomenon; however I am able to say it is not the case, and I now place on record—I believe for the first time—that an egg has been found containing two chicks. The egg in question was one of a clutch of five, very ordinary-looking, and very uneven in size, so much so that had I not known them to be a genuine clutch, I should have placed them on one side. This egg having somewhat the appearance of a double one, by its being so much broader than the others at the smaller end, made me examine it carefully. This I did by dividing the shell, and found an embryo in each end. These I removed, and by a little manipulation I placed the pieces of shell together, which show a very good specimen of a double egg, which I believe to be unique.

As this investigation was going on I occasionally met with an egg in which the embryo was dead, whilst the other eggs of the clutch contained healthy chicks. I knew it to be impossible for eggs to get chilled in such a warm nest as the sparrows generally build, but I thought it quite possible that their sharp claws might puncture the delicate shells. This I found to be the case. Having no wish to give the impression that I am shooting at these birds "with a long bow," I have preserved some specimens to corroborate the fact. It is curious that such a slight injury should destroy the embryo in nearly any stage of incubation, and also curious that these birds—considering the number of enemies they have—should assist in destroying their own eggs, from what may be called, hygienic neglect.

At the commencement of the season I expected it would prove a worse one than any I have recorded, owing to the great infertility of the eggs, and the shortness of the clutches, 10 per cent. only containing five eggs, against 20 per cent. in the previous year. But as the season advanced, matters greatly improved, bringing the season up to that of 1889, when the average brood was three young birds. In my report of last year I mentioned that very many young birds are turned out of the nests either dead or to die, and that so many more of these little outcasts were seen towards the close of the season than in the early part, is fair presumptive evidence that the fertility of the eggs improved as the season advanced.

The following figures show the slight variation in the brood during the past six seasons :—

1886,	average	brood,	$3\frac{1}{4}$	young	birds
1887	,,	,,	$3\frac{1}{8}$	,,	,,
1888	,,	,,	$3\frac{1}{3}$	,,	,,
1889	,,	,,	3	,,	,,
1890	,,	,,	$3\frac{1}{2}$	,,	,,
1891	,,	,,	3	,,	,,

There can be no doubt that the stock of sparrows at the present time is below the average, owing to the severity cf the late winter, and the objectionable practice of placing a price upon their heads.

JOSEPH P. NUNN.

Royston.

THE LIZARD ROCKS AND THE MARINER'S COMPASS.

THE favourite problem of Mr. Thomas Clark, of Truro, and Mr. Howard Fox, F.G.S., of Falmouth, on the magnetic rocks of the Lizard and district, was ably ventilated at the recent annual exhibition of the Royal Cornwall Polytechnic Society. Both these gentlemen have been laborious workers on the subject, and, as a consequence, their remarks carry weight. But while on the one hand Mr. Clark considers he has proved, by carefully conducted experiments, the magnetic properties of some of the Lizard Rocks, Mr. Fox, cautious scientist that he is, is inclined to doubt that these rocks have any appreciable effect on the mariner's compass at a distance of two hundred yards. At the Polytechnic meeting Mr. Clark demonstrated that the most highly magnetic rocks were those in the neighbourhood of Coverack and Black Head. The Manacles Rocks, stretching out into the entrance to Falmouth Bay, exerted very little influence on a magnet suspended by a silk thread. Mr. Fox also proved to the audience, by a series of skilful experiments on specimens of the gneiss and porphyritic diorites which compose the outer Lizard Rocks, that they were only magnetic to a small degree. Both gentlemen having conclusively demonstrated the more or less magnetic influence of the rocks forming the coast-line from the Lizard to the Manacles, the question turned on the effects of these rocks on the mariner's compass. Mr. Fox read some interesting extracts from the philosophical transactions of the Royal Society of 1890, which showed that Messrs. Rücker and Thorpe, after five years' close study of the question, seemed confident that the effect of highly magnetic rocks was practically inappreciable at a distance of two hundred yards. Mr. Fox said the influence of the serpentine forming the Black Head could be easily tested by sailing close to the point in and out of Kennack Bay, and steering by marks on shore independent of the compass. The magnetic rocks exhibited by Mr. Clark, he contended, had much less influence on a mariner's compass than on a delicately suspended bar magnet, and he considered that, though Mr. Clark had proved that many of the rocks in the Lizard district were strongly magnetic, until fresh evidence was forthcoming they must take Rücker's and Thorpe's investigations to prove that magnetic rocks had no appreciable effect on the mariner's compass at a distance of two hundred yards. The report of these two gentlemen on the magnetic survey of the United Kingdom extended over two hundred and seventy-five pages of the quarto volume, and was now the standard authority. They found that the most highly magnetic rock was the basalt in the Island of Canna, in the Hebrides, and concerning this they have written: "Although a compass will, within a foot or two of the basaltic columns around the summit of Compass Hill, in the Island of Canna, in the Hebrides, so disturb the needle as to cause a deflection of over 25°, this disturbing influence diminishes very rapidly at a distance. At an horizontal distance of eighty yards from the eastern side of this hill the disturbance diminishes from 33° from the top of the hill to 1·6° from its base." On leaving Canna in 1884, they sailed as close as possible to the north of the island, and frequently took compass-bearings and points of Skye, but were unable to detect the smallest deflections of the needle. In 1888 they approached the island in a yacht from the north, and when about three miles distant the yacht was directed to a mark on Rum, by which its course could be kept without reference to the compass. They passed Compass Hill within two hundred yards without observing any deflection of the compass, and they were quite certain that if there was any, it was less than 1·5°.

In the discussion, Mr. Henderson, C.E., mentioned that in Botallack mine, situated near Cape Cornwall, it was a most difficult matter to secure a bearing, owing to the magnetic rocks, and he had had to go down to one hundred and forty-five fathoms before he could get a bearing. The debate was the most instructive one Cornwall has been favoured with on this subject. At the close Mr. J. H. Teall, F.R.S., expressed a hope that Mr. Clark would continue his investigations and give them greater quantitative results. He would like to know the effect from equal masses at given distances. He considered Mr. Clark's method of determining the percentage of magnetic power extremely ingenious, and further experiments were highly desirable.

FRED. H. DAVEY.

Ponsanooth, Perran-ar-worthal, Cornwall.

HUNTING FOR ZOOPHYTES.

DURING a hasty search for Hydroida and Polyzoa in the tidal pools of Salcombe Harbour, (*vide* SCIENCE-GOSSIP, 1890, p. 196), I think that no two species afforded me greater pleasure in the subsequent examination, from the fronds of algæ, than the specimens here figured of *Beania mirabilis* and *Plumularia Catherina;* both were new to me, and both possessed characters which appeared to be worthy of observation.

Plumularia Catherina is quite visible to the naked eye. The fronds develop from creeping rhizomes, some of the pinnate branchlets being upwards of an inch in height, fragile in texture, and pale yellow in colour. It is probably the most graceful of all the Plumulariæ, as the pinnæ wave in the flowing tide. Examined beneath a low power, the transparent stems present a very beautiful appearance, a definite circulation being visible in every part of the growth. Granular particles are visible in a colourless fluid, which flows up to the extremities of the pinnæ and back again to the main stem. Whether it is true protoplasm which is revealed, or merely the particles absorbed by the polyps into a water circulation, I am not prepared to say; perhaps some more advanced biologist can offer a definite opinion on the point. In either case the organism is a singularly attractive one for the live-cell, and I have watched the circulation under the microscope with sufficient interest to forget my dinner, until recalled to the ebb of time by one in authority in such matters.

Hundreds of the polyps, meanwhile, were disporting themselves in full expansion, the eight tentacles grabbing incessantly at particles in the sea-water. Kick the table, and every polyp immediately contracted, to expand again, however, in less than two minutes. The stem is jointed or ringed between each unilateral cell. The intermediate small buds on each stem appear to have a tiny orifice, connected, perhaps, in some manner with the circulatory system referred to. The vesicles are somewhat pear-shaped, with circular rim slightly on one side. The habitat of this elegant zoophyte is on the stems of Fuci and Laminaria, in pools of the low-tide zone.

Fig. 206.—*Plumularia Catherina.*

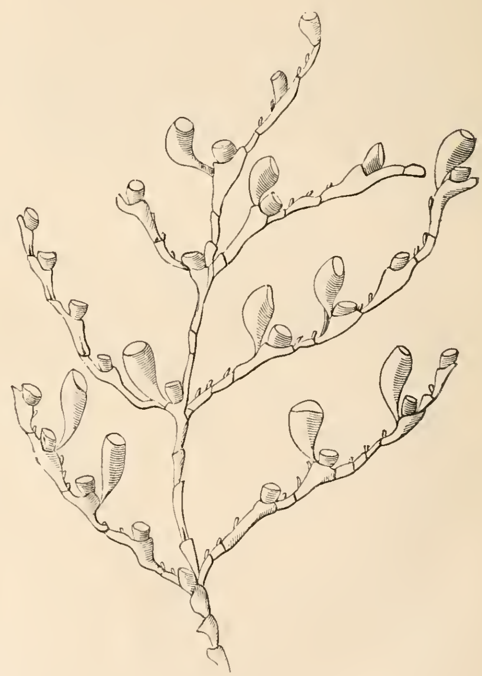

Fig. 207.—*Plumularia Catherina.* × 50.

In June and July, it is abundant at Salcombe and other places on the South Devon coast.

Fig. 208.—*Beania mirabilis.* × 50.

The *Beania mirabilis* is, I suppose, one of the rarer British marine Polyzoa; or perhaps it is a species which is occasionally over-looked in the wealth of parasitic growth. Fig. 209 gives the frond of Plocamium, on which the Beania attached itself in the low-tide zone. In the endeavour to present a picture of the natural growth, I think the real size of the microscopic organism has been unduly enlarged. As a matter of fact, the silvery white cells were barely visible, and I had no idea of the find until the microscope revealed the entanglement of finely-spiked cells, connected by creeping threads, and twisting in and out between the red fronds.

I have not been able to distinguish the slightest signs of life in my specimen, nor could I find any more in subsequent search through the same pools. I am under the impression that the polyp never has been seen. The frosted white of the stems is very attractive, and the curious form of the spinous cells renders the species unmistakable. Amongst the recorded stations around our coasts for the Beania, Scilly and Falmouth are named. Mr. W. P. Cocks is the authority for the Falmouth district, and Mr. Bean, I believe, discovered the zoophyte on a Cellularia, at Scarborough.

In our snatches of holiday, it is impossible to master the life-history of a tithe of what we may find; it would require steady work day by day for half a lifetime, to investigate the marine fauna of such a favourable spot as Salcombe estuary. But I am induced to offer these notes to readers of SCIENCE-GOSSIP, not because they possess original merit in this age of growing knowledge, but in the hope that young students may be roused to the pursuance of a delightful sea-side source of recreation and learning.

Fig. 209.—*Beania* on *Plocamium coccineum.*

C. PARKINSON.

THE ISLAND OF INCHKEITH.

By Chas. Wardingley.

To anyone glancing casually at the south-eastern portion of the map of Scotland, the Island of Inchkeith in the Firth of Forth appears so small and insignificant as scarcely to merit any lengthy or serious consideration. Even to many of those who have visited and spent some time in the Forth district the island has presented no special feature of interest or attraction further than that which is possessed by, and is common to, the other small islets which are dotted here and there in the immediate vicinity. Nay, even by the majority of those who have seen it, sailed past it or round it, and by many who have had the privilege of landing upon it, it would be curtly described and as promptly dismissed as "a small island with a lighthouse upon it." There are however exceptions, of which let us give two. Dr. Johnson (in the company of his biographer Boswell) visited it in 1773, and though he remarks that there was "rather a profusion of thistles," acknowledges very frankly that it had its redeeming features. "I'd have this island," he breaks forth; "I'd build a house, make a good landing-place, have a garden, etc.," and further avows that "a rich man of a hospitable turn would have many visitors." Carlyle visiting it at a later date, describes it as "prettily savage," "barley trying to grow under difficulties," "no inhabitants except seven cows and the lighthouse-keeper and his family," and although he neglects to tell us of the conditions of the kine, he is so far characteristic as to volunteer the information that "the lighthouse-keeper was by far the most life-wearyd-looking mortal I ever saw."

Neither is the prevailing general indifference shared by the commercial and military naval authorities. To the former it is a source of considerable danger and loss, its position midway in the channel of the Firth, and the presence of sunken rocks which surround it on all sides, only too frequently causing the disablement or wreck of some unlucky vessel, which, driven by stress of weather or a gale from the east, has been compelled to run for shelter into the quieter waters of the estuary. Almost every year,

> "When stormy March has come at last,
> With winds and clouds and changing skies,"

some craft or other is driven upon and broken to pieces by the rocks bordering this apparently insignificant island. Again, to those having charge of the naval defences of the kingdom, Inchkeith, commanding as it does the entrance to an extensive stretch of easily accessible coast-line, has been considered of such paramount strategic importance as to justify it in being acquired for defensive purposes, and with this object in view it has recently passed into the custody of the War Department. At the present time it is being strongly fortified, and will, ere long, be fully equipped with all the most recent scientific paraphernalia necessary to meet any emergency which may arise in time of war.

But our object just now is not so much to dwell upon its dangerous position or its strategic importance, as to place before the land-dwelling, peace-loving reader, a few facts connected with the island, which may be calculated to arouse and partially to satisfy his or her interest and curiosity.

In Anglo-Saxon times the island appears to have been known as Caer Guidi, or Fort of the River, and under this very appropriate name is mentioned by Bede. In 1010 Malcolm II. conferred it upon Robert Keith, one of the first Marshals of Scotland and founder of the Keith family, as a reward for personal courage and political services, and in this way the island acquired its present name. Since then it has been held successively by the Crown, the Lords of Glammis, and the Buccleuch family, while from the latter it has been obtained for the use of the nation. In the turbulent days of Queen Mary it was frequently made a subject of contention, and was in consequence the scene of many a fierce combat. In 1548, the year after the Battle of Pinkie, it was seized and fortified under the direction of the Lord Protector Somerset, who placed an English garrison upon it. Two years later this garrison was assaulted and expelled by the Queen Regent's French allies, over three hundred of its defenders being killed or wounded. It was re-garrisoned by the captors, who held it until the Treaty of Edinburgh, 1560. During this last occupancy a larger and much stronger fort or castle was built, doubtless with a view to future contingencies, but it remained intact only a very brief period, being destroyed by order of the Lords of Council soon after Mary's surrender in 1567. Its ruins remained until 1803 when they were removed to make way for the erection of the present lighthouse.

In 1497 the island was made an asylum to which all persons afflicted with an infectious distemper called "grand-gore" or "gran-gore" were to repair, "and there to remain till God provide for their health."

Robert Lindesay writing about 1550, chronicles a curious experiment said to have been made some fifty years earlier by James IV. His Majesty, moved with a laudable spirit for original investigation, conceived the idea that it might be interesting and possibly profitable to mankind, if he could discover the primitive language of the human race. Accordingly he caused to be taken to Inchkeith "ane dumb woman and two bairns with hir," desiring by thus setting them apart from the rest of their species, "hereby to know what language they had when they cam to the aige of perfyte speech." Details of the experiment are unfortunately not given, but the veracious author with a little commendable hesitation records that report said "they spak guid Ebrew," a result not more remarkable than if the verdict had been "guid Lowland Scotch."

The geology of the island is extremely interesting and is highly illustrative of that of the shores of Fife as seen at Pettycur, about two and a half miles to the north, of which probably the Inchkeith series is an outlier. It affords a very fine opportunity for the study of intrusive trap-rock and the accompanying deposits of calciferous sandstone and carboniferous shale. The first impression conveyed to the mind when the general mass is viewed from a distance is that it must have been the apex or plug of an extinct volcano, but a closer and fuller examination of the stratified rock soon dispels that idea. The trap (whinstone) is a greenstone or dolerite, composed of the minerals grey felspar and augite in very fine grains, and this rock comprises fully five-sixths of the entire island rising in the northern portion to a height of one hundred and eighty feet above sea-level. This trap would appear first to have fractured and displaced the sandstones and shales, and later to have protected them from the destructive influence of the sea by acting as a natural breakwater. The sedimentary beds have undergone a considerable amount of change, due to their contact with the igneous rock. Thus we find the shale converted into a hard, brittle rock which breaks almost like slate, while the sandstones are variously affected, here presenting a quartz-like appearance, there a burnt limestone effect is produced, and nowhere is it found where it has not been in a greater or lesser degree altered from its original texture, colour, and hardness. It is quite noticeable too, that in the proximity of its junction with the sedimentary rocks, the trap (or whinstone) loses its crystalline appearance and becomes of a red and earthy nature. In the southern part of the island many of the amygdaloidal cavities are filled with crystals of carbonate of lime, chalcedony, and silica, and these when water-worn have a very pretty effect, resembling some of the porphyries found in Perthshire. The dip of the intrusive trap and the stratified rock is to the north-east, the average being about 45°.

Having regard to the vast amount of heat evolved by the igneous rock when first poured forth, and the resulting changes in the strata, it of course follows that very few remains of past life reward the efforts of the geologist. As may naturally be expected, this extreme heat has all but obliterated them, and little or nothing is to be met with except the almost microscopical tests of the Ostracod crustacean *Leperditia subrecta* which occur fairly abundantly in the shale. Maclaren in his "Geology of Fife and the Lothians," suggests that the carboniferous limestone crops out in the bed of the Forth a little to the east of Inchkeith, but the persistent absence of limestone pebbles on the east shore tends somewhat to throw doubt on this supposition. Still, when we take into consideration the steep declivity of the rocks at this part, the great depth of the water and the direction of the currents, we have quite sufficient grounds for not accepting the absence of carboniferous limestone pebbles as conclusive evidence that the carboniferous limestone formation is wanting.

In the north-east of the island there is to be seen one of those curious memorials of prehistoric times known to archæologists as Kjökken-Moddings (Anglicè, Kitchen Middens) or shell-mounds. These are simply the refuse heaps upon which were thrown the shells and bones of the various creatures which were used as food by the primitive people who formed them. The example at Inchkeith, first brought into notice in 1872, may almost be considered as a typical one, and is well seen in a section made by the cutting of a military road leading to the North Battery. The entire exposure has a depth of a little over eight feet, consisting at the base of a fairly compact and dark-coloured rubble. Upon this is the mound made up of tens of thousands of cast-away shells of *Patella vulgata*, *Buccinum undatum*, *Purpura lapillus*, and *Littorina littorea*, together with a large number of bones, chiefly from the porpoise (*Delphinus phocæna*), and seal (*Phoca sp.*). Some of these bones have been split to enable the operator the more readily to extract the marrow, while many of them show traces of having been in contact with fire. The mound is in its turn covered by a loose rubble, varying in depth from twelve to sixteen inches, and consisting of sand and decayed vegetation. If this upper rubble were removed the shell-heap would be found to be in the shape of an irregular ring, with a diameter of from thirty to thirty-five feet and with a maximum depth of eighteen inches, "thinning" out as it gradually approaches the margin. Within or very close to this ring was reared the dwelling of the mound-makers, a dwelling situated on high ground, to which the sea although near was inaccessible. Unfortunately it is impossible to give even an approximate date to the period when these rude inhabitants lived, and the language they spoke, the customs they observed, and the conditions under which they existed are all lost to the pages of unwritten history. They were most probably a migratory people, wandering from place to place, living in exposed situations in summer and seeking shelter on the approach of winter. No weapons or utensils have yet been discovered at Inchkeith, but from those obtained in Denmark, where they have been very extensively found and studied by Professors Steenstrup and Worsaae, it has been inferred that they were made during the early Stone Period, and that they were quite probably of the same age as the earliest lake dwellings. It must however be mentioned that Sir John Lubbock records ("Pre-historic Times," 4th edition, page 234) the finding of a large bronze pin in the large shell-mound of Loch Spynie, which consequently would not be more than 1,200 years old. This seems a solitary and perhaps not altogether satisfactory "find," as by far the greater proportion of Moddings have as yet yielded only such weapons, etc., as would lead to the opinion that their formers were scarcely more than acquainted with the art of flint polishing, while their pottery was of the very rudest kind. Of the metals and their uses they were probably quite ignorant, employing instead the flints and bones which came so readily to their hands. From the absence of wood and stone in the mounds, except where the latter has been used as a hearth, we are led to believe that the middeners dwelt in tents made of skins, only slightly elevated from the ground. Though the transfer of the edible portions of the mollusca upon which they lived, from the shell to the stomach, would be accomplished without any very great regard for culinary preparation, yet the presence of a dark-coloured carbonaceous substance found diffused among the débris, and the marks of burning left upon many of the bones, point to the cooking of such larger fishes and birds as came in their way.

They do not appear to have had any knowledge of agriculture, not a single instance being known of any variety of grain having been found in the mounds. Even the shells and bones which they threw away bear witness that this early people had not the means of obtaining for themselves a very diversified meal. All the species of shells, with one or two rare exceptions, found at Inchkeith are such as may be gathered between high and low water mark, while the remains of the porpoise and seal are readily accounted for by assuming these creatures to have been caught in the various shallows and pools left by the receding tide. No human bones have yet been discovered in any of the shell-mounds, so that we are quite unable to form any definite opinion either as to the physique of this ancient race or their methods of disposing of the dead.

The Flora of Inchkeith is not very extensive, a circumstance fully accounted for by the exposed situation and the limited extent of the island, a strip of land about half a mile long by a quarter broad not affording very great scope for the growth of many varieties. No account of Inchkeith could be considered anything like complete which did not contain some reference to the zoology of the Forth in its immediate neighbourhood. A few hours' energetic dredging just off its rock-bound shores will yield quite a bountiful array of Estuarine Fauna. Large specimens of the beautiful sea-urchin, (*Echina sphæra*), numerous starfishes and crustaceans, many varieties of bivalves, and quite a host of the lowly but equally beautiful and interesting anemones, sponges, corallines, and seaweeds; these and many others abound in the adjacent waters.

It may fairly be questioned whether there is any spot in the kingdom of such limited extent, which is more replete with interest and instruction, more capable of yielding food for reflection and pleasure to the mind, more favourably situated for the study of the past and present of the great world of which this "green little isle" forms such an insignificant portion. If, as Bacon has enunciated, study is to be valued more as a discipline of humanity than as an exercise of the intellect, here then is a fitting place in which to put the aphorism into practice, and while we look into the beautiful and harmonious world of nature and life before and round us, let us dispel those lofty ideas of ourselves, and remember that we, like the ground below us, are but small fractions of this great and glorious universe. This done, and we shall then be able to substitute greater and more just views of the grandeur of creation and the perfections of its infinite Author.

THE BARNACLE GOOSE.

"As barnacles turn Poland geese
In th' islands of the Orcades."
Hudibras.

Caliban. "We shall lose our time,
And all be turned to barnacles."
Tempest, Act IV. sc. 1.

SOME years ago I was spending the Long Vacation at Eastbourne. It's an ill wind that blows nobody any good, and so it proved in this case. On the morning after the storm I noticed, while strolling

Fig. 210.—Bernicle Tree.

along the beach at an early hour, a large piece of wood cast up on the shore. Wondering whether it would prove to be a tree-trunk or only one of the timbers of some ill-fated ship, we drew near and examined it. To my great surprise and delight it was the former and nearly covered with patches of acorn shells (*balanus*) and barnacles (*Lepas anatifera*). My delight may be imagined, as this was my first acquaintance with these adult crustaceans in a state of nature.

Barnacles—order Crustacea, specific name Cirripedia [Lat. *cirrus*, a curl; *pes*, a foot]—begin life as active larvæ, resembling nauplius, and may be found every autumn swimming along our coasts in great numbers. This larva at its first moult develops a lateral mantle-fold. At its fourth change the front of its head becomes fixed by the flattening of one of the joints of the antennæ, and by the secretion poured out by a gland which, though placed in the body has its duct opening into the altered joint. At the fifth stage the eyes and antennæ vanish, the head becomes fixed by a broad base of attachment, the mantle-like fold of integument surrounds the body, and becomes calcified into a shell of many valves, within which the hinder parts of the body are enclosed, together with their six pairs of limbs. These limbs remain free and capable of protrusion, while the mouth with its mandibles lies at the bottom of the mantle cavity. Both the sexes are combined in one individual, and their fecundity is something marvellous. But to proceed, on passing along the beach a few hours later I noticed to my great amusement that the log had been taken possession of by some fishermen, who had rigged a tarpaulin over it, and were charging one penny admission to view the "Wonderful Sea Lioness." "What elastic imaginations some people possess!" was my comment. My companion replied that he had seen a paragraph in "Notes and Queries" to the effect that there was exhibited in Spring Gardens, London, a "Wonderful natural curiosity, called the Goose Tree, Barnacle Tree, or Tree bearing geese, taken up at sea on January 12th, 1807, and more than twenty men could raise out of the water." This "wonderful natural curiosity," was nothing more nor less than a tree-trunk covered with barnacles. The name of the individual under discussion, *Lepas anatifera*, literally "goose-bearing," takes us back in spirit to the times when the popular superstition proclaimed that the branches of certain trees on falling into the sea, collected sea-foam on themselves, and therefrom hatched a sort of shell-fish called barnacles, which in their turn evolved the bird going by the name of the barnacle goose.

This superstition of the Middle Ages owes its origin no doubt to the play of words, the barnacle being confounded with the barnacle goose. The former is derived, according to some authorities, from the Irish *barneach;* according to others it is the diminutive of the Latin *perna*, a shell-fish, *pernacula* being transformed into *bernacula* by a mere interchange of labial explodents, in strict accordance with the primary rules governing the permutation of sounds.

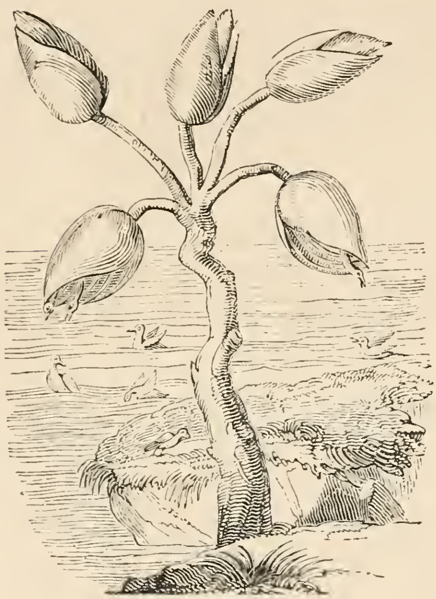

Fig. 211.—Bernicles transforming into Geese. (After Gerard.)

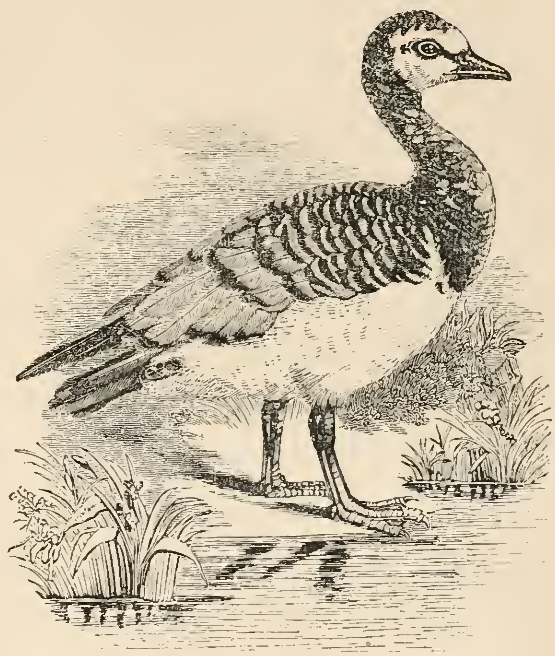

Fig. 212.—Barnacle Goose.

The name of the barnacle goose, on the other hand, is derived from the Low Latin *bernaca*, through the French *bernaque*. We have, according to Ducange, *Bernacæ, aves aucis palustribus similes* [Bernacæ, birds resembling the fowl in the marshes].

The story once placed on a sound footing, sceptics were told to read their Bibles, and give special attention to Genesis i. 20: "And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven."

That the clergy fed on the barnacle goose during Lent, we have conclusive evidence. The great divine *Giraldus Cambrensis* (or Gerald de Barri), who flourished between A.D. 1147–1222, does not attempt to disprove the miraculous origin of the barnacle goose, but he warns the Irish priests especially to abstain from dining off it during Lent on the plea that it was fish and not flesh, and describes an analogous case to support his words; "If a man during Lent were to dine off a leg of Adam, who was not born of flesh either, we should not consider him innocent of having eaten what is flesh."

One of the earliest references to this obvious fable is found in "The Voiage and Travaile of Sir John Maundeville Kt.," written in 1356 and dedicated to Edward III., and is as follows: "And natheless I tolde hem, of als gret a marvylle to him, that is amonges us; and that was of the Bernakes. For I tolde hem, that in our contree weren trees, that beren a fruyt, that becomen briddes fleeynge; and tho that fellen in the water, lyven; and thei that fallen on the erthe, dyen anon: and the ben right gode to mannes mete. And here of had thei gret marvaylle that some of him trowed, it were an impossible thing to be." Sir John's geographical position at the time he related this "marvaylle" is best defined in his own words: "In pasynge be the Lond of Cathaye toward the highe Ynde, and toward Bacharye, men passen to a kyngdom that man clepen Caldilhe; that is, a full fair contree." It was in this country that Sir John "astonished the natives."

Another writer, Baptisma Porta, states in his "Natural Magic": "Late writers report that not only in Scotland, but also in the river Thames by London, there is a kind of shell-fish in a two-leaved shall that hath a foot full of plaits and wrinkles . . . They commonly stick to the keel of some old ships. . . . . Some say they come of worms, some of the boughs of trees which fall into the sea; if any of them be cast upon land, they die; but they which are swallowed still into the sea live and get out of their shells and grow to be ducks or such like birds."

The next witness is John Gerarde, Master in Chirurgerie, the author of a "Herbal, or General History of Plants," (published in 1597), who gives us therein a chapter headed, "Of the Goose-tree, Barnacle-tree, or the tree bearing geese" and fully discusses the subject in the following terms:

"There are founde in the north parts of Scotland, and the islands adiacent, called Orchades, certaine trees, whereon doe growe certaine shell-fishes, of a white colour, tending to russet; wherein are conteined little liuing creatures; which shels in time of maturitie doe open and out of them grow those little liuing things; which falling into the water doe become foules, whom we call Barnakles, in the north of England, Brant Geese, and in Lancashire Tree Geese; and the other that doe fall upon the land perish and come to nothinge. Thus much be the writings of others, and also from the mouth of people of those parts, which may very well accord with truth. But what our eyes have seen and our hands haue touched, we shall describe. There is a small ilande in Lancashire called the Pile of Fouldres, wherein are founde the broken pieces of old bruised ships, some whereof haue been cast thither be shipwreck, and also the trunks and bodies with the branches of old and rotten trees cast up there likewise, whereon is founde a certain spume or froth, that in time breedeth vnto certaine, shels, in shape like those of the muskle, but sharper pointed, and of a whitish colour, wherein is conteined a thing in form like a lace of silk, finely woven, as it were, together, of a whitish colour, one end whereof is fastened vnto the inside of the shell, even as the fish of oysters and muskles are; the other end is made fast vnto the belly of a rude mass or lump, which in time cometh to the shape and form of a bird; when it is perfectly formed the shel gapeth open, and the first thing that appeareth is the aforesaide lace or string: next come the legs of the bird hanging out. And as it groweth greater, it openeth the shel by degrees, till at length it is all come forth, and hanging only by the bill. In a short space it cometh to fulle maturitie, and falleth into the sea, where it gathereth feathers and groweth to a foule, bigger than a mallard and lesser than a goose; hauing blacke legs and bill or beake, and feathers blacke and white, spotted in such manner as is our magge-pie, called in some places a pie-annet, which the people of Lancashire call by no other name then a Tree-Goose; which place aforesaid, and all those parts adioining do so much abound therewith that one of the best is bought for threepence. For the truth hereof, if any doubt, may it please them to repaire vnto me, and I shall satisfie them by the testimonie of credible witnesses."

Michael Drayton, a minor poet of the Elizabethan age, author of "Poly-Albion" (1613), a metrical and topographical description of England in thirty volumes, alludes to

"Th' anatomised fish and fowl from planchers sprung,"

in connection with the river Lee; and to this line a note is affixed in Southey's edition, to the effect that such fowls were "Barnacles, a bird breeding on old ships."

The myth, though attacked by Æneas Sylvius, Albertus Magnus, and others, was defended by Count Maier, who in 1629 wrote a book entitled "De volucri arborea," with arguments physical, metaphysical, and theological; and even so late as 1678 we find the testimony of Sir Robert Moray recorded in the "Philosophical Transactions," to the effect that he had seen "within the barnacle shell, as through a concave or diminishing glass, the bill, eyes, head, neck, breast, wings, tail, feet and feathers of the barnacle goose."

So the myth lived on, and I am informed lives now in the extreme west of Ireland, and also in the Highlands of Scotland. Professor Rolleston, of Oxford, did his share towards eradicating this superstition from the vulgar mind by shedding the light of science upon those darkened by ignorance. He prepared specimens of Lepadidæ in such a way as to show to the best advantage the manner in which the external appearance of Anatifera upheld the theory which derived *bernaca*, a goose, from *bernacula*, a shell.

Now a man who had been struck with the similarity of names would only require some slight ocular proof to be convinced of the truth of the hypothesis. The wish being father of the thought, this evidence was soon forthcoming. Away goes our friend and beholds a mass of these barnacles fastened to the keel of a ship or a piece of floating timber, and we all know that "Distance lends enchantment to the view," so he at once pronounces the foot of the crustacean to be the neck of the bird, and the shell its head, and goes home quite contented, and helps to spread the fable. As for the body of the creature, history gives us no account of it. *Non est hic.*

JOHN EYRE.

VEGETABLE TERATOLOGY.

As you seem to be working up the subject of Vegetable Teratology, the following notes may perhaps be of use to you.

In the Chronicle of the Agricultural Society of New South Wales, Dr. Woolls records a number of cases, chiefly dealing, however, with double flowers in the Australian native flora. Some of the plants mentioned were originally recorded by Baron Sir F. von Müller. Double flowers occur in *Rubus rosifolius*, Sm.; *Epacris purpurascens*, R. Br.; *E. microphylla*, R. Br.; *E. impressa*, Latreille; *Sprengelia incarnata*, Sm.; *Astroloma humifusum*, R. Br.; *Ranunculus lappaceus*, Sm.; *Eriostemon obovalis*, A. Cunn.; *Boronia pinnata*, Sm.; *Convolvulus erubescens*, Sims; *Wahlenbergia gracilis*, A. D'C. With regard to this latter species, naturally of a pretty blue colour, I saw near Alpha, central Queensland, during October 1887, that for miles along the railway line the flowers were abnormally white, not odd ones, but every example out of countless thousands.

Fasciation of branches occurs in *Goodenia heterophylla*, Sm.

I have myself seen fasciation in young leading shoots of Casuarina (Australian oaks).

During a recent excursion with some members of the Linnean Society of N.S.W., near Sydney, Mr. J. J. Fletcher, M.A., found two fine examples of our native flannel flower, *Actinotus helianthi*, Labill (Umbelliferæ), with prolific heads; in growth resembling the old-fashioned hen and chickens daisy.

During April last, I had brought to me, by a student of the college, a head of maize illustrating heterogamy. Normally the male inflorescence is a compound spike on upper part of plant, whilst the female flowers are in simple spikes on the stem below. In the example seen, numerous female flowers (seeding) were produced on the male inflorescence.

CHARLES. T. MUSSON.

Hawkesbury Agricultural College, Richmond, New South Wales.

SCIENCE-GOSSIP.

No provincial society is doing better or steadier work than the Bristol Naturalists'. We have just received vol. vi., part 3, of their "Proceedings," containing papers by Professor C. Lloyd Morgan, C. Bucknall, Dr. Burder, Mr. C. Richardson, H. P. Leonard, Dr. Edgeworth, H. W. Pearson, and others.

A most useful "Key to the Genera and Species of British Mosses" has just been issued by the Rev. H. G. Jameson, and published by Messrs. West, Newman & Co., 54 Hatton Garden, at eighteen pence.

The second annual report of the Missouri Botanical Garden, founded by Mr. Shaw, is to hand. The institution is safe to do good work under the superintendence of Professor W. Trelease. These volumes will be appreciated by botanists all over the world. They are nicely got up, and the plates are admirably drawn and finished.

To botanists, there is no more interesting or welcome brochure than the report of the Botanical Exchange Club. The Report for last year is fully up to its predecessors in this respect (Manchester, Jas. Collins & Co., King St.).

It is humanly and scientifically interesting to come into contact with what our friends and relatives are doing fourteen thousand miles away. We have before us the "Annual Report of the Stawell School of Mines" &c., for 1891, and a capital bit of work it records. Science means business, not hobbyism, at the Antipodes!

Le Diatomiste. The September part of this series (No. 6) contains two exquisitely finished plates. The capital paper by the editor, M. Tempere, is continued, on "Recherche et Récolte des Diatomées."

An old contributor to our columns, Mr. D. McAlpine, some years ago emigrated to Australia, where he has done some good original work, particularly in connection with the parasites of the copper-headed snake. We have just received a copy of a very important paper by him, contributed to the Royal Society of Victoria, and reprinted from their Transactions, on "Transverse Sections of Petioles of Eucalyptus, as Aids in the Determination of Species."

We are pleased to draw the attention of our microscopical readers to Mr. Chas. H. Hesketh-Walker's "Price List of Microscopical Specialities and Materials" (12 Church St., Liverpool).

Nos. 5 and 6 of the Proceedings of the London Amateur Scientific Society contain articles by Professor Boulger, Professor Blake, and Messrs. J. D. Hardy, A. M. Davies, A. H. Williams, and G. W. Butler.

The Liverpool Geological Society is one of the oldest of its kind in England. We have just received the "Proceedings" of its thirty-two Sessions (edited by Mr. H. C. Beasley). It contains papers (chiefly on local geology) by Dr. Ricketts, Messrs. Beasley, T. M. Reade, I. J. Fitzpatrick, G. H. Morton, E. Dickson, P. Holland, W. G. Clay, and others.

The "Proceedings of the Geologists' Association" for July and August, are as full of interesting and practical papers as usual, which is saying all one can.

Mr. F. Pugh has brought out an "Air-ball Cushion-tyre," for which he claimed the possibility of storing in the tyre a certain amount of spring force to come in action when required.

We confess to a weakness for book catalogues. It is delightful to run over lists of good books one cannot afford to buy. Pickering and Chatto's monthly "Leaflet" is delightful, with its fitting notes on rare or extraordinary old books. Messrs. Dulau's "Catalogue of Nat. Hist. Books" is another more than well worth perusing.

The last number of the "Essex Naturalist" is to hand, crowded as usual with abundant natural history materials relating to Essex. Among others is an interesting discussion on the Boulder Clay in that county, led off by W. H. Dalton.

"Stammering: its Nature and Treatment," by Emil Behnke, is published in paper covers cheaply, by T. Fisher Unwin. It is one of the best, briefest and most thoughtful essays on this subject we have read.

Dr. Riley's *brochures* on "Insect Life" are regularly placed before the public. Every number is marked by careful, and diligent work, good paper, clear print, in short, the perfection almost of scientific periodical literature.

Geologists interested in river valley gravels and flint implements, should read Prof. Prestwich's paper (read before the Geological Society) on "The age, formation, and successive drift stages of the valley of the Darent," with remarks on the palæolithic implements of the district, and on the origin of the chalk escarpment.

The Penzance Natural History and Antiquarian Society, have issued their Report for 1890-91. It contains papers describing charming Cornish excursions, the President's address, one on John Ralfs by E. D. Marquand; others on Coleoptera, Flints (by J. B. Cornish), the Diptera of West Cornwall (by C. W. Dale), etc.

One of Dr. Riley's most important papers (published by the U.S. Department of Agriculture) is to hand, entitled "Destructive Locusts: a popular consideration of a few of the more injurious Locusts (or grasshoppers) of the United States, together with the best means of exterminating them."

ZOOLOGY.

The Black Scoter breeding in Britain. I believe that it is generally stated by Ornithological writers that the Black Scoter (*Oidemia nigra*) has not been known to breed in the British Isles. It will be a novel, and interesting fact, therefore to record that a brood of seven of this duck was found early in September by Mr. Chas. Fowler on the Earnley Marshes, about six or seven miles distant from Chichester. The Rev. H. D. Gordon, the rector of Harting, and author of that, to naturalists especially, pleasurable book "The History of Harting," to whom I communicated this noteworthy discovery, has written the following notes, which will it give additional interest to the readers of Science-Gossip. The southward breeding of the Black Scoter, which has only been observed of late years, is a matter which tends to the enrichment of our foreshores in their fauna. The black negresses amongst the ducks (the only part not black is the orange ridge of the upper mandible, making it look like a coot's) have been gradually coming south; but it may be assumed that this is the first record of the common or black scoter nesting amongst us. In Yarrell's time the "black duck" bred in high northern latitudes, and generally arrived on Sussex shores in winter. Curiously enough Saunders (p. 454), says "Without special reference to the Scoters, advantage may be taken to remark upon the perceptible increase that has taken place in the numbers of various species of ducks, which breed in the British Islands since the passing of the Wild Fowl Protection Act in 1876." Saunders' admirable "Manual of British birds" (Gurney and Jackson, 1889) may henceforth include—

and not, as it now does, exclude—the Scoter from the record of birds breeding more southward than they did.—*Joseph Anderson, Jun., Chichester.*

Monstrosity of Clausilia rugosa.—I lately found a specimen of this common snail having two mouths instead of one. Both were sinistral, and of equal size, one forming the aperture of protrusion and the other not communicating with the interior, but fully formed in every particular. I should be glad

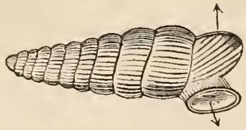

Fig. 213.—Monstrosity of *Clausilia rugosa.*

to know if other collectors have noticed a similar condition. I was impressed by the fact that the opening in use was colourless, whereas the unused one had the normal markings. The conclusion which was irresistibly borne in upon my mind by this fact, is that the snail having fastened himself in by his patent door-apparatus, was unable to let himself out again, and was forced to break the wall and add a back-door to his residence. I should be glad to hear the opinions of other conchologists on this matter.—*H. Downes.*

Preserving and arranging Shells.—Allow me as a collector of many years' standing to give the results of my experience with regard to the safe preservation of shells in collections. The great object to be aimed at, and for which no necessary expense should be grudged, is, as I have learned by sad experience, to prevent the shell and the name ticket from being separated. For this reason trays are very unsafe for any shells in whose apertures the ticket cannot be securely stuffed. I once lost the names of the greater part of a series of species of Mitra through the accidental fall of a drawer in which the specimens were in cardboard trays; but a much slighter cause than this, a puff of wind, or the breath of the conchologist himself, is often sufficient to produce the same result. Pill and chip boxes are so unsightly that I fancy but few would care to use them. Glass-capped boxes are undoubtedly the best, except for very minute or very elongated shells, which are better in tubes; they are, however, very expensive. The plan I have adopted as best combining efficiency with economy is this. 1. All shells which have no opercula or teeth in the mouth, and which are large enough to have the name securely placed in the aperture, are loose. 2. All shells of which the diameter does not exceed that of a fourteen-millimetre tube are, unless very flat, put in tubes. 3. All shells too large for tubes but not large enough to have their names in their mouths, or in which that is prevented by an operculum or teeth, together with such flat shells—as Trochomorpha or Helicina—as would be unsightly in tubes, I place in glass-capped boxes. When I speak of tubes I mean such as have one end closed. Glass tubing, in rods to be cut into short cylinders by the purchaser, is most unsafe, as the wool-plug at one end or the other is constantly liable to be pushed out. Moreover I should imagine that but few would care to take the trouble of cutting up the rods for the small saving effected. Tablets, except for a museum, are an abomination. Only lately a dealer was unable to send me a specimen of the scarce and beautiful *Helix regina* because he had injured it in taking it off the tablet on which it had been fixed. Conchologists, who can safely preserve their specimens in other ways, have not the excuse for putting their shells on tablets, that entomologists have for carding their beetles, etc.; though even as to insects the late Mr. Frederick Smith once told me that he would not have undertaken to name the British Museum collection of Hymenoptera if they had been carded, so many characters are thereby hidden. I may add that glass tubes effect a saving in two ways, they are much cheaper in themselves, and they occupy much less cabinet-room than glass-capped boxes.—*C. P. Gloyne.*

Stranding of a Humpbacked Whale on the Northumbrian Coast.—What is believed to have been a specimen of the somewhat rare humpbacked whale (*Megaptera boops*) was found on the Northumbrian coast in the first fortnight of last month. It was first seen floating dead off Craster, but was let alone by the fisherfolk at that place, as they were otherwise occupied. It then drifted more southward, and was fetched ashore by the people of Boulmer. I visited the carcass at this latter place; it had, however, been skinned before my arrival, but from what observations I was able to make, and the intelligence I gleaned from the natives, I came to the conclusion that it was the species named above. It measured twenty-nine feet two inches in length. The throat and chest were strongly plicated with broad square-cut grooves running parallel to each other in the direction of the long axis of the body. The special feature of this whale is the great size, or rather length, of the flippers, to which its scientific designation Megaptera points. They are white, whereas the colour of the rest of the body is dark grey. It differs from the Rorqual in being more squat in form, i.e. greater in girth, in proportion to its length. The blubber and whalebone are comparatively worthless, and in fact this species is not, I believe, commonly pursued by whalers. If, as all the available evidence seems to show, this was a humpback, it will, I think, be found to be only about the fourth on record for the British coast. One was killed on the coast near Newcastle in 1839; one in the estuary of the Dee in 1863, and one in the mouth of the Tay, in the winter of 1883–4.

The skeleton of the second example is preserved in the Liverpool Museum.—*H. J. Torpey.*

VERONICA CHAMÆDRYS.—The grub mentioned by your correspondent Mr. Woodruffe Peacock as causing a distortion of the upper leaves of this plant is no doubt that of *Cecidomyia Veronicæ*. See Frank's Pflanzenkrankheiten, (Schemks' Handbuch der Botanik, vol. i. p. 547). The insect is a near relation of the Hessian fly (*Cecidomya destructor*) and of the wheat midge (*C. tritici*), both of which are fully described in Miss Ormerod's "Manual of Injurious Insects."—*D. H. Scott.*

MICROSCOPY.

ON THE SUPPOSED DISCOVERY OF PSEUDOPODIA IN DIATOMS.—We are much pleased to insert the following paper, by Mr. G. H. Bryan (an old contributor, but youthful and promising scientist) from the "International Journal of Microscopy, &c." :—At the recent meeting of the British Association in Cardiff, Mr. J. G. Grenfell read a paper "On some species of Diatoms with Pseudopodia," in which he announced that the pseudopodia of diatoms have at last been observed. The species on which they were discovered belong not to the motile, but to the fixed forms, being of the genera Melosira and Cyclotella. The discovery was made at an excursion of the Quekett Club to the Botanical Gardens, Regent's Park, where Mr. Grenfell found the diatoms swarming all over the surface of one of the ornamental pieces of water, forming quite a little cloud of a nearly pure gathering. At a subsequent visit he was unable to obtain such pure gatherings, but the diatoms were still present, and he collected a quantity of material for future observations. The pseudopodia were seen under a $\frac{1}{6}$th object-glass, and nearly all belonged to a small kind of Melosira, whose frustules were mostly simply united in pairs, though they sometimes formed short chains. The frustules of this diatom were very soft and hardly at all siliceous, and they were destroyed by boiling in acid. Mr. Kitton thought the diatoms were a variety of *Melosira varians*, but Mr. Grove had never seen pseudopodia attached to *M. varians*, and doubted their belonging to that species. At the second visit, *Cyclotella Kutzingiana* was found abundantly in the locality in question, with pseudopodia attached. Mr. Grenfell afterwards found diatoms with pseudopodia at Stanstead in Hertfordshire, and at Westbury in Wiltshire he found many of the streams swarming with a delicate Melosira, which was covered with pseudopodia. Probably, further observations will show that such diatoms are by no means uncommon, and that they are widely distributed over the country. The pseudopodia are quite invisible when the diatoms are immersed in water, and the best way of seeing them is to dry the diatoms by allowing the water containing them to evaporate gently on the cover. The appendages will then be seen spreading out in all directions, often thickly matted together. They may be stained with an aqueous solution of gentian violet, with methyline blue, or with fuchsine. A solution of borax-carmine stains the bases only, while alcoholic stains fail altogether. After staining, the diatoms may be mounted in balsam. In no case were the pseudopodia seen to move; they appeared to be stiff and non-contractile. They are arranged fairly symmetrically round the frustule, their number being usually from seventeen to twenty, though occasionally, as in the genus Cyclotella, there are as many as thirty-four pseudopodia, arranged with remarkable regularity. The pseudopodia are usually perfectly straight, but sometimes they are branched. Sometimes their surface is beaded or granular, and sometimes they are quite thick and even slightly siliceous at the base, but in all cases they were found to be destroyed by heat. They always seem to spring from the large markings on the frustule, but sometimes two pseudopodia seemed able to fuse into one another. The frustules were generally united in two's and rarely in longer filaments. Mr. Grenfell supposed that the pseudopodia have three uses: they serve as protections, as floats to sustain the diatom, and for the purpose of attaching it to other objects. The author did not think that they bear any analogy to the processes of Chætoceros. Mr. Grove had suggested that the pseudopodia were simply extensions of a gelatinous investing layer, but Mr. Grenfell doubts this. It might also be thought that the appearance was due to some rhizopod, such as a Vambrella, investing the diatom, but such cannot be the case. Over two hundred frustules of Melosira, all furnished with pseudopodia, were found in one dip of the material, and in no case did Mr. Grenfell see any trace of an investing animalcule. Moreover, such an animalcule would very rapidly kill and devour the diatom, whereas Mr. Grenfell found that the diatoms remained alive for a considerable time. The author also pointed out that if the pseudopodia belonged to an investing organism, it would be highly improbable that they would be distributed symmetrically round the frustule. The pseudopodia bear considerable resemblance to those of certain heliozoa, such as *Archerina Boltoni*. This animalcule occurred in abundance in the later gatherings which Mr. Grenfell made at the Regent's Park; and it was not improbable that the diatoms might occasionally be mistaken for rhizopods, especially where both were found in the same gathering. The remarkable similarity between the pseudopodia of Melosira and Cyclotella and those of Archerina, when considered in conjunction with the presence of cellulose in Archerina, would seem to indicate a greater affinity than that already known to exist between the more lowly forms of the animal and vegetable kingdoms. From Mr. Grenfell's description, it does not seem probable that the pseudopodia could ever be used as organs of locomotion, and their discovery does not therefore throw much light on the much-debated question of the movement of diatoms. It seems to me more probable that the so-called "pseudopodia" are in reality identical with the bristles attached to such filamentous diatoms as Chætoceros, Bacteriastrum, etc. These genera are furnished with siliceous bristles distributed symmetrically round the frustules and often branched, and the diagrams which Mr. Grenfell exhibited in illustration of his paper bore a close resemblance to the figures of these "bristly" forms given in many books. The principal difference seems to lie in the fact that the supposed "pseudopodia" of Melosira and Cyclotella were non-siliceous and were destroyed by boiling in acid, whilst the bristles of the marine genera mentioned above, are siliceous and indestructible by heat and acids. But this difference is not unnatural when it is remembered that even the frustules of the Melosiræ were only very sparingly siliceous. It is perfectly natural to expect that the greater amount of silica present in the frustules of the marine forms, should be accompanied by the presence of silica in the processes attached to them. Whatever be the ultimate conclusions arrived at with regard to the nature of the supposed pseudopodia, Mr. Grenfell's discovery is extremely interesting, and not the least important feature consists in the fact that the processes, although invisible in water, were at once seen when the diatoms were dried. Microscopists will do well to search the streams and ponds in various parts of the country, and to carefully examine the various species of Melosira and Cyclotella, with a view of confirming or disproving Mr. Grenfell's belief that diatoms furnished with these processes are common and generally distributed.

Cleaning Slides.—In answer to the enquiry by H. Verinder at page 238, I write to say that I have found that by placing the "spoiled microscope slides" in a strong solution of caustic potash for a day or so the varnish, balsam, etc., etc., can readily be removed and rendered fit for use again. I use a common earthenware receptacle for the purpose, and before attempting to wash off the varnish, etc., or to clean the slides I transfer them to a basin containing hot water, so as to get rid of the caustic potash, otherwise the fingers might suffer.—*W. M. Young.*

Cleaning Varnish.—I usually boil the slides in an old saucepan in water containing a small lump of common washing-soda. This removes the balsam and asphalt very readily. It is advisable not to put too much soda, as otherwise the solution may act on the glass. For the same reason care should be taken that the slips remain always immersed; if any of the liquid should dry on them, the surface will become permanently clouded over. When the slides have boiled for about a quarter of an hour, wash in water and wipe dry.—*G. H. Bryan.*

New Slides.—Mr. Fred. Enock's "mounts" are always microscopical gems, to be awarded the best and securest place in the cabinet. The last Mr. Enock has sent out is an object of this character—the head of the six-eyed spider (*Dysdera erythrina*). The ring of six closely set eyes gleams like a ring of noble opals. From Mr. A. Flatters, of Oldham, we have received another consignment of his wonderfully neat botanical slides of transverse and longitudinal structures. These are accompanied by neatly drawn sketches, pointing out the details, so that both slides and sketches ingeniously combine to render the botanical student as much service as possible in the shortest time.

BOTANY.

Flora of Kent.—To K. E. Styan's notes on the local flora of Kent I have collected a few additional plants, which I think will be useful to his list. In the woods about Otford and Shoreham, *Cephalanthera grandiflora* grows rather abundant, with *Listera ovata* and *Orchis maculata;* in the beech woods near Shoreham, *Monotropa hypopithys* grows plentiful; on the chalky pastures about the hills, *Calamintha acinos*, and *Calamintha clinopodium*, sometimes in company, but less frequent with *Nepeta cataria* and *Campanula glomerata;* about streams, *Scrophularia aquatica* and *Verbena officinalis;* in corn-fields *Galeopsis ladanum* and *Verbascum nigrum*, with *Ballota nigra*, which grows about hedge-banks, and road sides; on the hill, *Ononis arvensis* and *Carduus acaulis* are very common. Two butterflies which I saw very plentiful about there was the dark green fritillary, and the marbled white.—*Henry E. Griset.*

Floral Guide to Kent.—In answer to M. B. Wigan (p. 238) M. H. Cowell's "Guide to East Kent, etc.," was published at Faversham, and by Pamplin at Wandsworth, 1839. But the only way to obtain a copy now, is through the second-hand booksellers. Let him try Dulau and Co., 37 Soho Square, W. They had a copy in 1889, or Wheldon, Great Queen Street, Lincoln's Inn.—*Arthur Bennett.*

An old Experiment in preserving quickly Fading Flowers.—On the evening of June 21st last, I received from a friend a freshly opened specimen of the night-blooming Cereus (*Cactus grandiflorus*) and it still remains open, a thing of beauty, with its calyx, corolla, and stamens distinct from each other. As this flower invariably opens in the evening and fades by the following morning, few persons ever get to see it when fully opened. The method of preserving it simply consists in immersing the flower in water and excluding the air. I took a propagating-glass and a dish of rather larger diameter than the glass, and having tied a small weight to the stem or frond of the flower to keep it in position, I plunged the flower, glass, and dish, into a large tub of water, and while in the water placed the flower on the dish and inverted the propagating-glass over it, carefully excluding air bubbles, then lifted all out of the water together. During all this time I have only changed the water once. This was at the end of the second week, when the dissolved yellow colouring-matter obscured the view.—*Edward Shackleton, Whitworth.*

Mr. Styan's Rose.—The rose referred to by K. E. Styan, in Science-Gossip of this month, (page 236), appears to be *Rosa spinosissima*, the Scotch or Burnet rose (syn. *R. pimpinellifolia*). It differs materially from the commoner forms of *R. canina*, in being much more crowded with prickles, the leaves having nine leaflets, and the remarkable development of the hips. The sketch given by your correspondent is correct as regards size and shape, but the position should be reversed, for by the curvature of the petiole the hip does not grow erect, but pendent with the persistent sepals downwards. I have a fine garden specimen of this rose, which is sold by the dealers under the name of *Rosa rugosa alba*, with white flowers, and a variety with purplish red flowers distinguished as *R. rugosa rubra.*—*J. W. Fisher.*

Extraordinary Growth of "Wild Rose Hips."—The figure and description of an abnormal wild rose hip in your last number agrees exactly with the fruit of the Japanese rose: *Rosa rugosa.* From the description of the flower and the fact that the plant was growing in a garden, I strongly suspect that the plant belonged to this species, and was not a wild rose at all. If Mr. K. E. Styan will send me his address, I will gladly forward him fruits and leaves of *R. rugosa* for comparison; it is fruiting very freely this year.—*R. Scott.*

Rose-Hips.—Surely the Rose-hips mentioned by your correspondent K. E. Styan in Science-Gossip for last month are nothing more than the hips of *Rosa rugosa*, which is remarkable for the clusters of large round hips which it bears. I have not seen the fruit of this rose for some years, but as far as I can remember the figure given with this letter is exactly like them. The description of the flower, "a very large, single, and either white or very pale pink," corresponds with the blossoms of *R. rugosa.* The foliage is not mentioned: that of the *R. rugosa* is very different to that of our wild roses, the veins being much indented below the surface of the leaf. The bunches of hips when ripe are very beautiful objects; it is a pity this rose is not oftener cultivated than it is.—*G. S. S.*

Notes on the Flora of Braunton Burrows.—I have found *Matthiola sinuata* growing in conjunction with *Statice*, not on the Burrows themselves, but on a piece of rocky coast north of the Burrows. *Erodium maritimum*, as well as *E. acutarium*, grows in the neighbourhood.—*G. H. Bryan.*

Holly Fern in Herefordshire.—It is over twenty years since my mother found plants of the holly shield-fern in a lane in Herefordshire. This autumn, being in the same neighbourhood, we re-visited the locality, and again found one or two plants, which Professor Hillhouse and another botanical friend affirm to be genuine *lonchitis.* They were growing in a grassy and ferny bank by the side of a country lane—a place quite out of character with the usual habitats of the fern. I enclose a couple of small fronds of the fern, which, I think, will be found to possess all the characteristics of *Aspidium lonchitis.* The plants appeared to be less plentiful than formerly.—*G. H. Bryan.*

GEOLOGY.

The Geology of the Lake District.—The undermentioned process may prove interesting to some of your readers, and may be confidently recommended in similar cases to all young students of geology just before they are about to embark on an "original theory." Being in the Lake District, in that part where, according to the savants, what they call the eruptive rocks of lower Silurian age, alias the green slates and porphyries of Borrowdale, are exposed, I determined to form a really scientific acquaintance with the ultimate principles, so to speak, of the stuff whereof all the highest mountains in England are composed. Repairing to a fresh wrought quarry I selected as clean, unaltered, and decent-looking a piece of rock as I could see, and with the aid of a workman's big sledger I smashed the rock into as fine a powder as could well be under the circumstances, and wrapping it in paper I put it in my pocket. Happening to have with me a small box of chemical reagents, etc., and purchasing a bottle of strong hydrochloric acid from a local apothecary, the process was begun. The particles of the rock were first reduced to a very fine powder in an agate mortar and no great exertion was required to effect this. In fact, it was rather surprising how easily this was done, and how very different the stuff appeared thereafter; in the original bed it was a rather dark bluish grey, but now it seemed almost quite white. Some of the acid was poured upon the powder, and after gently heating for some time, the whole mess was evaporated to dryness; a few drops of acid poured on the residue and then some hot water, the mixture stirred up, and filtered. The quantity of solid matter left on the filter gave a rough idea of the amount of silica in the original rock, in this case say about sixty per cent. The filtrate contained the bases, and in order to separate and detect these a slight excess of ammonia was added, when a very considerable precipitate of alumina and iron was thrown down. It may be observed that the figures mentioned here are those derived from a strict quantitative analysis, and not merely guessed from the rough investigation now described. Here then we had separated those two very important constituents of the rock, and the amount thereof, say nearly fifteen per cent. of the former and nearly eight per cent. of the latter, seemed as seen, as it were, for the first time very astonishing, and even still more so when, after boiling the washed precipitate in strong solution of caustic potash, the iron was left in a quantity much larger than what could have been anticipated. The ammoniacal filtrate from these two constituents contained the rest of the bases in the rock. On adding thereto a solution of oxalate of ammonium, lo and behold! an immense and bulky precipitate of lime was immediately produced. It represented about six per cent. by weight, so that this indeed was the "surprise of the day," and the feeling culminated to the acme when, after detecting small quantities of magnesia and potass in the residuary solution, the big authorities on the subject were consulted. For it would appear, what is in truth a highly interesting fact, that the various constituents of this Borrowdale series differ very considerably as regards the amount of lime contained therein respectively. The rock just analysed contained six per cent. in the form of carbonate (the brisk effervescence on adding the acid showed this), and it was a specimen of lava ash (pyroxene-porphyrite of the savants) perhaps physically altered, although it looked not so; but the quartz-felsite, which seems widely extended at intervals throughout the series, contains only a little over two per cent., and the Skiddaw slate and granite, which bounds the series to the north and west, has only about one and a half per cent. Wherefore this difference in the proportion of lime? The speculators of the school of Lyell aver that these green slates were deposited in the sea whence it derived its calcareous intermixture; and the mathematical surveyors of the district assume that a colossal dome of limestone originally extended over the greater part or perhaps the whole of these eruptive rocks, perhaps even to the highest summits of the mountains. A comparison of the analytical results aforesaid at once disposes of the former hypothesis; and the dip or angle whereon the latter calculation is based would carry the stuff so very high that my imagination is quite undisposed to follow it. —*P. Q. Keegan.*

NOTES AND QUERIES.

The Common Snake.—I have in my possession a very fine living female specimen of *Tropidonotus natrix*, which I purchased in the spring. Some months ago she cast her slough, and emerged in all the splendour of a fine new coat. Lately she has become very sluggish, and used to remain in the branches of a small tree for days together. I could not account for this sleepiness, for her eye had no appearance of the cloudiness visible whenever they commence to change their skins. However, the reason has now become apparent, for within the last few days she has presented me with ten eggs. In colour they are a dirty white, and the outer covering, which closely resembles the membrane lying immediately beneath the shell of a bird's egg, is quite soft. The first two were discovered on the 10th ult., in different parts of the cage, these I removed because a violet ground-beetle, who also shares the case, had commenced to demolish one of them with evident relish, and on the 12th I discovered five more. Three of these last lay together, but the rest, which were laid on the three following nights, were scattered about over the cage. They were not connected in any way with each other. I mention this fact because it seems to be contrary to the observations of others, notably, the Rev. J. G. Wood, who states that the eggs of the grass-snake are deposited in chains, each egg joined to its neighbour by a glutinous substance; again, G. Christopher Davies in "The Swan and her Crew," who describes them as connected together by means of a sort of glue. I should like to know whether it is common for grass-snakes to deposit their eggs without the chain in question. Perhaps some of your readers have met with similar instances. I was very anxious to hatch these eggs, and placed one of them, by way of experiment, in the sun, covered with some dry leaves. However, a small portion of the egg received the direct rays of the sun, with the result that it was drawn up into a boil, and all around the albumen was coagulated.—*A. E. Peake.*

The Flora of a Cart-track.—When walking on the Downs to-day between Seaford and Eastbourne, I noticed a cart-track leading from a farm across the turf of the Downs to some pits from which flints were probably obtained. I had been noticing the characteristic flora of the Downs here: *Euphrasia officinalis*, *Phyteuma orbiculare*, *Campanula glomerata*, *Gentiana amarella*, etc., and was much interested to find that along the two ruts formed by the wheels of the cart, an entirely different set of flowers grew, standing out in sharp contrast to the compact and diminutive natives of the Downs. Those in the ruts were: *Cerastium triviale*, *Agrimonia eupatoria*, *Achillea millefolium*, *Matricaria chamomilla*, *Echinum vulgare*, *Bartsia odontites*, *Anagallis arvensis*, *Polygonum aviculare*. All of these are common weeds of waste or cultivated ground, and their seeds had probably been brought on to the downs in the mud adhering to the cart-wheels.—*Rina Scott.*

Albinism in Plants.—It may interest those of your contributors who have been making notes of the occurrence of albinism in plants to know that last month, being at Largs, in Fifeshire, I saw a fine white variety of *Centaurea scabiosa*. At one part of the Bents there was a fine display of the beautiful reddish-purple flowers of this handsome plant, and amongst them there occurred one root with pure white flowers.—*J. Carphin.*

Huge Puff-balls.—Having a very unusually large Puff-ball (*Lycoperdon giganteum*) lately come up in a gap in a laurel hedge here, I think it might interest the readers of Science-Gossip. It is still firm and white, though slightly turning colour from the continued heavy rain; it measures 36 inches in circumference, and 34 starting from base round the top to root. Again, there are two more near it, one almost entirely eaten by slugs before coming up; the other, at present young, measures only 16 inches by 16. I noticed in SCIENCE-GOSSIP a number or two back mention of bats flying in the sunshine. Before seeing your paragraph I myself had noted the same thing, and thought it uncommon; first, in January or early February, in spite of the cold, one was flitting in the bright sunshine outside our fence at about half-past ten A.M. Again, just as we were looking for the swallows (late this year) I noted two flitting about merrily for an hour or two before noon, and for the first minute thought they must be the long looked-for swallows come at last. The enclosed are, as you will see, a curious form of monstrosity in an everlasting, and some little shells, the latter taken from the gizzard of some snipe shot about 27th January, having just arrived at some ponds near here. Could you tell me if they are brackwater shells?—*R. Moxon, Surrey.*

AN ANCIENT EARTHQUAKE.—Could any of your readers give me any information on the following? In Camden's "Britannia" of 1610 there is a map of Herefordshire by Christopher Paxton, and near Woolhope I find marked "Kynnaston chap—which was dreuen doune by ye remoueng of ye ground," and in the description of the county Camden tells us: "Neere unto the place where Lug and Wy meet togither eastward, a hill, which they call Marcley Hill in the yeere of our redemption 1571 (as though it had wakened upon a sodaine out of a deepe sleepe) roused itselfe up, and for the space of three daies togither mooving and shewing itself (as mighte and huge an heape as it was) with waving noise in a fearful sort, and overturning all things that stood in the way, advanced itselfe forward to the wondrous astonishment of the beholders by that kinde of earthquake, which as I deeme naturall philosophers call Brasmatias." Old Drayton in his "Polyolbion" refers to it also:

"But Marcely, grieu'd that he (the neerest of the rest
And of the mountain kind), not bidden, was a guest
Unto this nuptiall Feast, so hardly it doth take
As (meaning for the same his station to forsake),
Inraged and mad with griefe, himselfe in two did viue
The trees and hedges neere, before him up doth driue,
And dropping headlong doune, three daies together fall,
Which, bellowing as he went, the rockes did so appall,
That they him passage made who Coats and Chappels crusht
So violentlie he into his valley rusht."

Selden, in his notes to the first edition, 1613, says, referring to this: "Alluding to a prodigious division of Marcely Hill in an earthquake of late times, which most of all was in these parts of the island." Can any of your readers inform me whether anything is now to be seen at Marcely Hill of the effects of this earthquake mentioned by Camden, Drayton and Selden.—*Henry James, Merthyr Tydfil.*

DOUBLE PLUM.—I enclose a sketch of a curious double plum, which you may perhaps find of interest to you. Also the two stones and the fruit-stalk. It was given to me by a friend, and was grown in his garden at Hounslow. The plum was of a purple colour, with a pellucid greenish flesh, and the two stones were close together, the spaces being filled with "gum." You will observe that they fit into one another in some sort of a fashion. The reverse side to that represented in the sketch was similar, as far as I could see, in all respects, except that the suture was not quite so deep. The sketch is natural size.—*T. Alfred Dymes.*

NATURAL HISTORY OF SLOW-WORMS.—It may be interesting to some of your readers to hear that three days ago one of several slow-worms I have in my possession presented me with a family, the number of which I do not yet know. Is not this very late in the year? Professor Bell gives June or July as the usual time for the bearing young. The most interesting fact about it is that the young slow-worms have been not only *born*, but *bred* in captivity, for I have had the old ones in my possession for about eight months; the usual period of incubation is from six to eight weeks.—*H. D. Tilly.*

RINGED SNAKE.—Since writing to you on September 17th my snake (female specimen of *Tropidonotus natrix*) has died, and as it was a very fine one, and it is, I believe, rather unusual for a snake to lay eggs in captivity, I thought it might interest some of your readers to hear something of its anatomy. Up to September 15th it had laid ten eggs, all of which were separate. On the 27th it seemed very unwell, and died in the afternoon. The tenacity of life exhibited by the muscles was extraordinary, for although the head and anterior extremity of the body were stiff and dead, the rest twisted and moved about for several hours whenever a stimulus was applied. I must say I fail to understand why the muscle-plasma should coagulate so slowly in the case of a snake or slow-worm, and yet so quickly in man and the higher animals. Entire length of snake, two feet eleven inches, including the tail, six inches. When the skin was stretched upon a board it measured three feet two inches without the tail at all. It is a curious fact that the membrane which in most other animals is split and serves them as eyelids should remain intact in a snake. The difference in habits of the snake and slow-worm is not very great. Both crawl along the ground and are subject to the same inconveniences in regard to sight, such as dust, etc., and yet the slow-worm has a split membrane, and the snake has not. Doubtless this fact serves very well to distinguish the snakes from the lizards, when to all appearance they would seem to belong to one class, but I should like to know what explanation is offered to account for this peculiarity in structure. It cannot be indicative of a very low form of life, for in the class of Batrachians next below them in the scale we find very well-developed eyelids. The tongue of this snake measured $4\frac{1}{4}$ inches. Of this $2\frac{1}{2}$ inches was ensheathed and black, whilst the remainder consisted of a bundle of muscular fibres. Two thin rods of cartilage, presumably representing the hyoid bone, ran, one on either side of this muscular part, and they, together with the tongue, were fastened to the trachea by a small muscle. The left lung only was present, although the trachea divided as usual into right and left bronchi. The interior of the lung was sac-like, and resembled in appearance the linked armour which was formerly worn by knights in battle. The liver measured eight inches. The ovaries, two in number, contained in all 113 ova. Of these twelve were perfectly developed, and resembled those already laid. One of these fully-developed ova had passed down the oviduct to within a couple of inches of the cloaca, and was larger than any of the others. The oviduct around it was much inflamed and injected with blood, and I suppose this was the cause of death. In the tissue between the intestine and oviduct was a quantity of white coagulated substance, which I imagine to be the remains of an ovum which in some inexplicable manner had escaped from its proper channel. There was nothing peculiar in the other organs. I was much surprised at the very slight development of the brain, which was certainly smaller than that of a frog.—*A. E. Peake.*

The White Flower Question.—In view of the undoubted importance of variation as an aid to the study of the developmental history of plants, it is gratifying to see so much attention being directed to the subject. Henslow, in his "Origin of Floral Structures" says: "To attempt any theoretical exposition of the evolutionary history of flowers considerable caution is required, for the causes of variation are generally so obscure, the chances of seeing them in activity so small, and experimental methods of verification well-nigh impossible, that speculations on the subject cannot altogether escape the bounds of hypothesis so as to become demonstrable facts." Notwithstanding this, we find him at a later stage declaring that "variation in the number of parts of the floral whorls is largely due to an excess or a deficiency of nutriment," and that "colours are a result of nutrition." He further says, "The paler tints, or even a total absence of colour may seemingly occur as a variety of any plant; it is often a concomitant of habitual self-fertilisation in cases where the variety of species is a degradation from some conspicuous and brightly-coloured insect-visited form. White-flowered individuals often appear as 'sports' among seedlings, the immediate cause of which it would be difficult to assign, beyond the general one of the absence of those nutritive conditions which are requisite for colours." Here, then, we have a theory of colour, whether or not it will stand the test of experiment is a different matter, but if temperature and the character of the soil affect the forms of flowers, why may they not also affect their colours? Grant Allen glances at the subject in his "Origin of the Colours of Flowers," but he has no better explanation to offer of reversion in a red or a blue flower to white than the tendency to reversion that exists in all forms of plant-life, especially such as have been recently evolved. Thus, writing of reversion in the wild hyacinth, he says: "The frequent recurrence of white varieties in our wild hyacinth proves that it is still far from having completely adapted itself to its present level of development, as thoroughly well-established and ancient species do not throw back so easily or so often to less advanced ancestral forms," a view of reversion which accords with that expressed by Darwin in his "Origin of Species" (6th edition, p. 121). These statements suggest one or two points to which, as it seems to us, attention may profitably be directed. (1.) Is it the case that when flowers change from one colour to another it is in an unvarying order, from yellow to white, from white to red, and finally to blue?—reversions, of course, in inverse order. (2.) If this is so, why is it that blue flowers—the wild hyacinth, for instance—revert directly to white instead of to red, the colour from which they have more recently been evolved? (3.) Is it the case that lessened vegetative vigour tends to check the development of colour, and if so, to what extent does the check operate? If I am not greatly mistaken, there are numbers who would warmly welcome authoritative answers to these questions. This season I have carefully noted the occurrence of white varieties, and as the list may be of interest to others, I append it for comparison. The district embraced in my observations is the north-west portion of the border county of Dumfriesshire, which has a varying elevation of from 250 to 1600 feet. *Viola palustris*, *Viola tricolor*, *Polygala vulgaris*, *Epilobium montana*, *Scabious succisa*, *Campanula rotundifolia*, *Erica cinerea*, *Calluna vulgaris*, *Gentiana campestris*, *Veronica scutellata*, *Euphrasia officinalis*, *Pedicularis sylvatica*, *Ajuga reptans*, *Prunella vulgaris*, *Symphytum officinale*, *Orchis mascula*, *Hyacinthus nonscriptus.*—*John Corrie.*

The White Flower Question.—In connection with the correspondence on this subject, it may be interesting to mention that a few weeks ago at Malvern Wells, I found a quantity of *Bartsia odontites* growing by the roadside leading up from the Midland station. A large proportion of the plants had pure white flowers, while of the remainder a great many had flowers of a pale pink colour, a great deal lighter than usual. This was not a case of an isolated albino, as the white flowers predominated. Near Cambridge on the Hills road, *Geranium pyrenaicum* grows abundantly in one spot, but the flowers are invariably white. I have never seen lilac specimens in Cambridgeshire. The same remark applies to the comfrey, *Symphytum officinale*, which is always white-flowered about Cambridge. I have found albinos of *Ononis arvensis* (rest-harrow) year after year in the same spot by the road leading from Cambridge to Newton. Also solitary white specimens of *Cichorium intybus*, and *Centaurea scabiosa.* Two years ago I found white *Gentiana campestris* at Fort Augustus, while at some height above the Lake of Como, in 1878, I found *Gentiana acaulis* with some flowers of a pure white and others of a pale "Cambridge blue," forming a striking contrast to the usual dark "Oxford blue" hue of the flowers.—*G. H. Bryan.*

The White Flower Question.—Now that Mr. P. Q. Keegan has evinced an interest in this subject, I begin to hope for some workable information. To his queries in last month's number, I subjoin the following:—The heather is in full bloom in this neighbourhood, from the early part of August to the close of September, white varieties included. The atmosphere of this county, undoubtedly contains a deal of moisture; and it is certainly as indisputable that with certain winds, the atmosphere is also highly charged with saline substances. Perhaps it will be only fair to add, while this question is being discussed, that the flowers of the white heather which I have pressed this summer, have turned to a delicate pink in the drying process. The colour, I noticed, asserted its presence in about forty-eight hours after the plants were placed in the press. Of course it is not near so pronounced as the normal tints of the heather.—*Fred. H. Davey*, *Ponsanooth*, *Perran-ar-worthal.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

To our Recent Exchangers.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

H. E. G.—Get Bennett's "Manual of Cryptogamia," published by Longmans at, we believe, 6*s.*

C. H. Betts.—We are much obliged by your complimentary query, but we beg to say that, as a magazine or otherwise, Science-Gossip is perfectly free, and sails under no auspices except those of publisher, editor, and generous and loyal contributors. It has been issued thus for twenty-six years, and perhaps no other popular scientific journal has such a world-wide or large circulation. Our views are perfectly independent, although we endeavour to make them comprehensive and sympathetic.

C. T. Musson (Hawkesbury, N.S. Wales).—Many thanks for specimens of "green roses." They are not uncommon, and on this side of the world we have known florists who made money by cultivating "green rose" trees. Of course, it is a question of return of the petals to the foliar or green condition. The real inquiry ought to be as to whether this greenness is due to the presence of *chlorophyll*, or otherwise.

EXCHANGES.

Rotifera.—Can anyone send me specimens of *Callidina pigra*, *C. symbiatica*, or *C. Liebhardti?* Correspondence invited.—David Bryce, 37 Brooke Road, Stoke Newington Common, London, N.

Wanted, a good selection of mounted histological slides; also minerals and geological mounted slides. A reasonable price given.—W. F. Crews, c.o. F. F. and Co., Rangoon, Burmah.

Wanted, all kinds of good unmounted micro material and microscopical books, in exchange for choicest microscopic slides of every variety. Foreign correspondence solicited.—R. Suter, 5 Highweek Road, Tottenham, Middlesex, England.

Sphærium lacustre, *Helix fusca*, *Pisana pulchella*, *Clausilia laminata*, *Balia perversa*, and many others. Wanted, species and varieties of many land and freshwater shells.—H. Downes, University Union, Edinburgh.

L. C., 8th ed.:—109, 115, 193, 272, 315, 396, 493, 574, 579, 611, 648, 691, 966, 976, 982, 1101, 1134, 1154, 1200, 1422, 1439*c*, 1459, 1529, 1538, 1753, 1759, &c. Lists invited.—W. Biddiscombe, 60 St. James's Place, Plumstead, S.E.

Land molluscs from the Bernese Oberland, in exchange for foreign helices from any country. Also *Helix elegans* from the only British locality.—Rev. J. W. Horsley, Woolwich.

Wanted for the museum, typical collections of minerals, sea-weeds, corallines, or lichens; must be correctly named. Will give in return typical collections of beetles, butterflies and moths, or cases.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

Offered, L. C., 8th ed.:—3*b*, 41, 101, 105, 107*b*, 116, 121, 141, 176*b*, 193, 221, 229, 240, 291, 335, 336, 338, 341, 483, 536, 538, 562, 576, 611, 635, 698, 854, 859, 863, 873, 901, 918*a*, 928*b*, 944, 957, 969, 970, 973, 1189, 1194, 1196, 1212, 1224, 1232, 1344, 1421, 1483, 1518*b*, 1563, 1593, 1629, 1630, 1688, 1743, 1753, 1772, 1794, 1813, 1845. List of desiderata on application to—J. A. Wheldon, 9 Chelsea Road, Walton Vale, Liverpool.

Offered, Cassell's "Familiar Wild Flowers," forty parts, and "Fishing Gazette" for 1889–91. Will accept natural history specimens or books in exchange, or other offers.—H. Fisher, Stodman Street, Newark, Notts.

Wanted, entomological cabinet, store-boxes, &c. Can offer in exchange about fifty species of British birds' eggs, mostly in clutches, and a few with nests; also fossils from secondary and tertiary rocks.—W. D. Carr, Lincoln.

What offers for about fifty kinds of animal hairs, fish scales, exotic and British lepidoptera, and dragonflies' wings, &c. Also about forty British birds' eggs (unnamed). Wanted particularly, land and freshwater shells, and the following books: Rye's "Beetles," Rimmer's "Land and Freshwater Shells," Taylor's "Aquarium," &c.; condition immaterial so long as no pages missing.—H. Durrant, 4 Boulton Road, West Bromwich.

Wanted, botanical slides, good sections. A packet of unmounted material from New Zealand, of which I have six different, will be given in exchange for each slide.—W. A. Gain, Tuxford, Newark.

Wanted, a good copy of Beale's "How to Work with the Microscope," in exchange for a collection of 258 Swiss plants, including some of the rarest: *Anemone Halléri*, *Ranunculus glacialis*, *Dianthus superbus*, *Potentilla frigida*, *Leontopodium alpinum*, *Artemisia mutellina*, *Hieracium aurantiacum*, *Gentiana glacialis*, named and mounted.—Bernard Stracey, 45 Fountain Hill Road, Edinburgh.

For exchange, bred specimens of ruby tiger (*A. fuliginosa*), six vols. Science-Gossip, including two with coloured plates, and McAlpine's "Botanical Atlas," unbound. Wanted, books, tricycle, and a few good diatom and botanical mounts.—J. C. Blackshaw, 179 Penn Road, Wolverhampton.

Well-mounted palates of British land and freshwater shells in exchange for good foreign land or freshwater shells.—William Moss, 13 Milton Place, Ashton-under-Lyne.

Duplicates.—*T. haliotidea*, *H. Cantiana*, var. *albida*, *H. virgata*, vars. *alba* and *albicans*. *H. Cartusiana*, *H. caperata*, var. *major*, *P. secale*, and *C. laminata*, var. *albinos*. Desiderata, good local forms of *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *H. virgata*, and *H. ericetorum*, or offers.—C. H. Morris, Lewes, Sussex.

Offered, a large selection of mosses, *juncace*, *carices*, *hepaticea*, in exchange for lichens (named), or a copy of Hobkirk's "British Mosses" would be acceptable.—Albert Downie, 40 Dallfield Walk, Dundee.

Wanted, some one to cut and polish a few geological specimens. Will give Alston Moor minerals for doing it.—William Hetherington, Nenthead, Alston Moor, Cumberland.

Good encrinite heads and palatal teeth of *Psephodus magnus* from Carboniferous limestone, *Vertigo pygmæa*, and *Zonite excavatus*, var. *vitrina*. Wanted, foreign land shells.—Cairns, Queen Street, Hurst, Ashton-under-Lyne.

Science-Gossip for 1889, "Brit. Assoc. Handbook of Manchester," and "The Point and Line." Wanted, copy of "L. C." 8th ed., &c.—G. H. B., Thornlea, Cambridge.

Duplicates.—*H. nemoralis*, *hortensis*, *arbustorum*, *ericetorum*, *Cantiana*, *caperata*, *Coch. tridens*, *Claus. laminata*, *Vertigo pygmæa*, &c., fossils from carboniferous limestone and Yoredale shale, Derbyshire minerals. Desiderata, land, freshwater and marine shells, and fossils from various formations.—H. E. Craven, Matlock Bridge.

Astronomical telescope, 2¼-inch object-glass, on solid brass table stand with steadying rod, having rack and pinion adjustment, very highly finished. Want good monocular or binocular microscope. State maker's name.—Dr. Taylor, 26 Marchmont Street, London, W.C.

Duplicates.—Fine *Sphærium ovale* and *S. rivicola*, *Unio pictorum*, *U. tumidus*, *Paludina vivipara*, *Limnæa stagnalis*, *Anodonta cygnea*, *Helix arbustorum*, *Planorbis corneus*. *Pupa marginata*, &c. Desiderata, other British land and freshwater shells.—R. Dutton, Piccadilly, York.

Duplicate clutches of goldfinch, sociable plover, Montague harrier, water-rail, ring ousel, goldcrest, crested tit, coil bunting, eider, duck, and eggs of capercaillie, widgeon, scaup, twite, hen harrier, merlin, &c. Desiderata, many kinds commoner eggs.—Jas. Ellison, Steeton, Keighley.

Wanted, varieties of British land and freshwater shells. Can offer very fine *Pupa secale*, *B. obscurus*, vars. *strigata* and *bizona*, *Balia perversa*, and many others. A. Alletsee, 1 South Villas, Kensington Road, Redland, Bristol.

Duplicates.—*Emarginula rosea*, *Trochus Montacuti*, *exasperatus*, *striatus*, *Rissoa reticulata*, *calathus*, *inconspicua*, *cancellata*, *lactea*, *Cæcum glabrum*, *Helix revelata*, *Cyclostrema nitens*, &c. Wanted, British marine and foreign shells not in collection.—Brockton Tomlin, The Green, Llandaff.

Fossil shells from the Barton clay, Purbeck limestone, and Kimmeridge clay, offered in exchange for fossils, minerals, and rocks of other formations. Address—Mr. A. E. Salter, 8 Venetia Road, Finsbury Park, N.

Duplicate clutches of little bittern, curlew, shieldrake, b.-h. gull, swallow, cuckoo, marsh-tit, Manx shearwater, reed warbler, magpie, jackdaw, whitethroat, lesser redpole, tawney owl, chaffinch, eggs of hoopoe, lesser whitethroat, guillemot, razorbill, widgeon, &c. Desiderata, clutches, side-blown and with data.—F. W. Paple, 62 Waterloo Street, Bolton.

H. lamellata, *H. fusca*, *P. ringens*, *An. lacustris*, and numerous other species offered for any shells, British or foreign, not in collection. Also fossils for others, or offers. Foreign correspondence specially desired.—Rev. John Hawell, Ingleby Greenhow Vicarage, Middlesbrough.

BOOKS, ETC., RECEIVED FOR NOTICE.

"British Edible Fungi," by Dr. M. C. Cooke (London: Paul, Trench, Trübner & Co.).—"Physical Geology and Geography of Ireland," by Professor Ed. Hull (London: Stamford).—"Le Diatomiste," No. 6 (September) (London: Baillière, Cox & Co.).—"The Essex Naturalist."—"American Microscopical Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"Feuille des Jeunes Naturalistes."—"The Microscope."—"Journal and Proceedings of the Royal Society of New South Wales," &c., &c.

Communications received up to the 12th ult. from: J. C.—T. A. D.—D. H. S. S.—F. H. P. C.—C. J.—A. E. T.—J. H.—T. A. L.—J. E. L.—R. S.—H. E. G.—H. D.—H. F.—C. J. M.—R. S.—F. P.—D. B.—J. A. jun.—W. H.—W. H. N.—J. J. O. C—J. A. W.—E. A. W. P.—W. B.—R. S. M.—E. M. J.—E. S.—I. H. C.—A. E. P.—A. D.—A. B.—G. S. S.—W. M.—C. H. M.—E. B.—I. W. B.—G. P. G.—J. C.—W. D. C.—W. A. G.—E. S.—I. K.—H. J. T.—C. H. B.—D. N. S.—J. H. A. H.—D. P. Q. K.—H. F.—R. C.—E. D. F.—C. T. M.—G. E. T.—A. E. S.—J. S.—T. E. A.—B. T.—J. W. F.—J. H.—R. B.—A. A.—J. E.—J. H. D.—G. L. E.—J. W. P.—R. D.—Dr. T.—H. E. C.—G. H. B.—T. M.—W. T.—&c., &c.

NEO-DARWINISM.

By A. G. TANSLEY.

[*Continued from p.* 244.]

MR. FRANCIS GALTON'S theory of heredity has been variously described as "a modification of Darwin's"* and as "substantially the same as that of Professor Weismann."† We shall endeavour to show, however, that neither of these representations is correct. Mr. Galton's theory, indeed, stands in an important manner intermediate between "Pangenesis" and "the continuity of the germ-plasm," but it is a perfectly distinct theory. In 1872 the main ideas were promulgated, but a fuller account was published in 1876.

Mr. Galton sets out with a conception of the organism as composed of microscopic "organic units." He does not distinctly state whether these correspond to cells, but with our present knowledge it seems probable that, in many cases at least, they would have to represent portions of cells. This conception he thinks is necessitated by the facts of the inheritance of microscopic characters, and the inheritance of these from different parents. He explains this by supposing that each organic unit is developed from a separate germ or "gemmule." The whole collection of gemmules in the fertilised ovum he calls the *stirp*. Hence we see that he adopts the preformation theory to explain the problem of development. But as we shall presently see, his hypothesis differs in an important manner from the complete conception of preformation adopted by Darwin, the destructive criticism of which by Professor Weismann we have already quoted.

Mr. Galton argues from the transmission to offspring of latent characteristics, derived from ancestors but not appearing in the body of the transmitter, that many gemmules must remain altogether latent during the lifetime. He conceives of the stirp as dividing, before the beginning of embryonic development, into two parts, first, those gemmules which are predominant, and which enter upon embryonic development, and secondly the "residue," *which remain latent in the body, and from which the reproductive elements are mainly if not solely derived.* Here we are presented with an entirely new solution of the problem of transmission. Mr. Galton explains the difficulty by supposing not that the bearers of the hereditary tendencies are redeveloped from the cells of the body in each generation, but that there is a *continuity* of gemmules from generation to generation, and that the structure of each organism is built up by certain *representative* gemmules, which achieve development. Mr. Galton remarks that there are two classes of facts of heredity: (1) the transmission of inborn or congenital peculiarities, also congenital in one or more ancestors, (2) the transmission of those inborn peculiarities not congenital in ancestors, but acquired owing to changes in the conditions of life. He points out that Pangenesis was especially devised to explain the latter class; but he remark that the majority of these cases may be looked upon as "a collection of coincidences," that it is "indeed hard to find evidence of the power of the personal structure to react upon the sexual elements that is not open to serious objection," and that "we might almost reserve our belief that the structural cells can react

* Lloyd Morgan's "Animal Life and Intelligence," p. 135.
† Wallace's "Darwinism," p. 443.

on the sexual elements at all." Hence Mr. Galton only adopts the theory of Pangenesis *as supplementary and subordinate*, to explain the cases in which acquired characters may possibly be transmitted; he explains the primary facts of heredity by his theory of the continuity of the reproductive elements. By adopting this position he dispenses with Darwin's conception of gemmules representing every stage in ontogeny, and thus although he believes the "organic units" of adult structure to be preformed in the germ, we can conceive of the separate "representative" gemmules developing *epigenetically* into the adult structure. This does away with the difficulty expressed by Professor Weismann in the criticism above quoted. Mr. Galton's theory approaches Professor Weismann's, but is nevertheless distinct from the latter. We shall discuss the points of difference more fully hereafter, and reserve our criticisms till then.

	Author.	Date.	Name.	Explanation of Transmission.	Explanation of Development.	Bearing on the Transmission of Acquired Characters.
General theory.	H. Spencer	1863	"Physiological Units"	The assumed solidarity of the organism. A separated group of physiological units or plastidules, by means of the "polar forces" or "vibratory movements" common to them and to the other units, can build up an organism like that from which they were separated.		Involves such transmission.
	E. Häckel	1876	Perigenesis of a Plastidule.			
Theories which recognise the separate problems of transmission and development.	C. Darwin	1868	Pangenesis.	*Redevelopment* of gemmules from every cell in the body.	*Preformation* of gemmules representing every cell ever produced by the parent, which unite in such a way that they develop in exactly the right order.	Involves such transmission.
	C. Nägeli	1884	"Idioplasm" theory.	*Redevelopment* of somatic into germ idioplasm.	*Preformation* of germs ("Anlagen").	Involves such transmission.
	F. Galton	1876	"Stirp" theory.	*Continuity* of "residual gemmules."	*Preformation* of gemmules representing "organic units."	The essential part does not involve such transmission, but the complete theory does not exclude it in all cases.
	A. Weismann	1885	Continuity of the germ plasm.	*Continuity* of germ-plasm from generation to generation.	*Epigenesis*. Successive transformations of nucleo-idioplasm during development.	Excludes such transmission.

Professor Nägeli's theory of heredity (with which I am only acquainted through Professor Weismann's criticism) is intimately bound up with his ideas of phylogeny or race-development, with which we are not concerned, but of that portion which deals with the two problems which we are keeping before us, a short account must be given.

Professor Nägeli's hypothesis reminds us to some extent of Pangenesis, and to some extent of Mr. Spencer's hypothesis, but to its author belongs the credit of originating the valuable conception of "idioplasm." Professor Nägeli supposes that there is a network of solid substance extending throughout the body, which determines the specific character of the organism. This is *idioplasm*, and although differing qualitatively in different species, its nature is fundamentally the same in the different parts of the body of the same organism. The development of an organism is dependent upon the successive activity of different parts of the idioplasm; when any part has become active, the tension between that part and the rest becomes such that further growth of that part cannot take place, but the next part begins to grow actively.

The idioplasm is composed of germs ('Anlagen') of the different structures, each of which, reacting under the stimulation of the growth of the previous ones, becomes active in its turn and produces the corresponding structure. This is very like Darwin's conception of the development of gemmules. When all the stages of ontogeny have been passed through, the idioplasm returns to its original state—never having differed from it except in respect of "conditions of tension and movement"—and produces germ-cells. This is the theory of the "cyclical development of the germ-plasm" and reminds one of Mr. Spencer's views on physiological units, which are also apparently fundamentally the same in different parts of the body. If, however, there is such a substance as idioplasm, it is to be found in the cell nuclei, as we shall see hereafter, and cannot be conceived of as forming a network throughout the body. Furthermore it is impossible to conceive of the difference between the idioplasm of, for instance, a muscle-cell and a white blood-corpuscle as consisting in a mere difference of "conditions of tension and movement." Professor Nägeli adopts the hypotheses of redevelopment and preformation in essence, though he considerably modifies former conceptions.

Professor Weismann's hypothesis of the continuity of the germ-plasm differs from all former theories by his complete adoption of the epigenetic explanation of ontogeny, and of the explanation by continuity of the germ-plasm of the problem of transmission. He supposes that a substance (germ-plasm) with a specific molecular structure is handed on from generation to generation. Part of this, at the commencement of segmentation, is separated off for the building up of the bodily structure, the rest is preserved unchanged and is eventually transmitted to the sexual cells. That portion which is converted into the idioplasm of the body undergoes an actual change of molecular structure at each stage of ontogeny.

We are now in a position to arrange the various theories of heredity we have considered in a table, which shall show at a glance their *kind* of explanation of the general problems of heredity, and as an outcome of this their bearing upon the question of the transmission of acquired characters. We see at once from the table (p. 266) that (apart from Mr. Spencer's and Professor Häckel's hypotheses) those theories which explain the problem of transmission by supposing that redevelopment of the specific bearer of hereditary tendencies takes place in each generation, involve the transmission of acquired characters, while those which explain the problem of transmission by supposing that this specific substance is continuous from generation to generation do not. And it is obvious that this must be so. We can form no clear conception of how it is possible for acquired characters to be reproduced as such in the next generation except by the aid of the hypothesis of re-development. Mr. Spencer's and Professor Häckel's theories do not furnish such a clear conception. And the clearest expression of the hypothesis of re-development is undoubtedly to be found in Mr. Darwin's theory of Pangenesis; for Professor Nägeli's theory does not present us with a sufficiently definite and intelligible mechanism.

The issue, then, seems at present really to be between Pangenesis and a theory of continuity of the specific hereditary tendency-bearing substance. But we have seen that there are objections of the gravest kind to the hypothesis of Pangenesis. It is therefore incumbent upon us to examine more in detail the theory of continuity as it has been expressed by Mr. Galton and Professor Weismann. If any form of it explains the general facts of heredity with ease and certainty, and can be shown to be in accord with the general tendency of research, we shall be justified in accepting it, provisionally at least; and we shall be further justified in considering that this is, so far as it goes, good evidence against the transmission of acquired characters. It is perfectly true that the transmission of acquired characters may take place, and yet that we may be unable, at present, to arrive at a clear conception of the mechanism by which it is brought about; but it is also true that if, in the absence of direct affirmative evidence on the point, and from quite other considerations, the theory which excludes such transmission can be shown to be more likely to be correct than the theory which involves it, we are forced to consider this fact alone as evidence which negatives its probability.

ROSSENDALE RHIZOPODS.

No. 7.

NO Rhizopod belonging to the sub-order Filosæ has a more elegant and complex shell than that of any of the seven species of Euglypha, which is characterised by the colourless, transparent test, being made up of oval plates, overlapping in such a way as to form very definite and beautiful patterns, and by being further ornamented by numerous spines or hairs. Fortunately, some of the species are very common and widely distributed, being found in the ooze of most ponds and ditches, among Sphagnum, and on dripping rocks with mosses and Algæ. During the short period I have devoted to the special study of the Rhizopods, I have found hundreds of individuals belonging to two species, *Euglypha alveolata*, and *E. ciliata*. The former is the commoner species here, and is a very variable form, both as regards size and definiteness of structure. Ordinarily, the shell is transparent and colourless, egg-shaped, with the narrow end truncated by the mouth; but in some of the larger ones the lower end is prolonged, when it appears somewhat flask-shaped. These larger forms I have not yet been able to find, but in these, according to Professor Leidy, "the shell is clearly seen to be composed of regular plates, of nearly equal size, of oval form, arranged alternately in longitudinal rows and overlapping at their contiguous borders. This arrangement produces the impression of hexagonal areas defined by zones of smaller elliptical areas" (see Fig. 215). In the smaller forms, which I have procured in abundance from among mosses and Algæ in several of our

Fig. 214.—*Euglypha alveolata.* Specimen showing sarcode retracted, and test with apparent diamond-shaped workings.

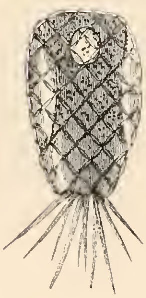

Fig. 215.—Ditto, pseudopodia extended.

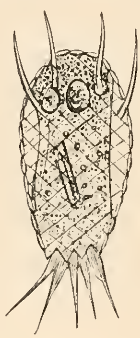

Fig. 216.—Specimen of ditto with four spines; pseudopodia extended.

wells, the structure is not, by any means, so clearly defined; indeed, in the majority of individuals, the structure of the shell is very obscure, and, when seen at all, frequently appears only as fine, diamond-shaped markings. Some specimens show from two to six thorn-like spines of about equal length, attached to the shell near the fundus or top; in others these appear to have been rubbed off. The sarcode is generally colourless, though sometimes yellowish or brown, occupying most of the shell, though often constricted in the middle, in an hourglass manner, as in Figs. 214, 215 and 216. Nucleus large, situated near the fundus. The size of this species, like that of most Rhizopods, varies considerably; my specimens averaged about $\frac{1}{300}$ or $\frac{1}{400}$ of an inch in length, but the larger forms from Sphagnum are as much as the $\frac{1}{100}$ of an inch in length.

Fig. 214. Specimen with sarcode retracted, showing hourglass-like contraction: test with diamond-shaped markings.

Fig. 215. Prettily-marked form, pseudopodia extended.

Fig. 216. Another, with hourglass-like contraction of sarcode; pseudopodia extended; with four spines.

Euglypha ciliata is exclusively of sphagnous habitat. It very closely resembles *E. alveolata*, but the shell is more compressed, and has a fringe of hairs or spines round the top and sides. These spines vary considerably, not only in numbers, but also in length and strength, and in the amount of surface they cover. In most other respects it is identical with *E. alveolata.*

Fig. 217. Empty colourless test, structure obscure, but indicating overlapping plates.

Fig. 218. Another specimen, with finer and more numerous spines, covering nearly the whole surface.

Trinema enchelys is one of the smallest, and also

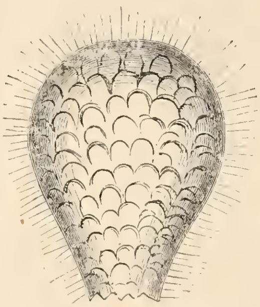

Fig. 217.—*Euglypha ciliata.*

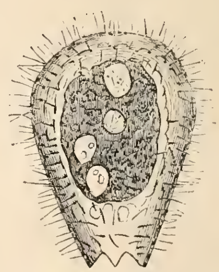

Fig. 218.—Ditto, another specimen.

one of the commonest, of the testaceous Rhizopods. It is a rare thing to find a pond or ditch which will not furnish specimens of this ubiquitous animal. In squeezings from Sphagnum I have procured them in thousands, and, according to the authority previously quoted, "it is often found in the earth about the roots of mosses and other plants, even in such places as roadsides, on the bark of trees, old wooden or thatched roofs, and in the crevices of pavements of cities." The shell is transparent, colourless and pouch-like, with the oral end generally the smallest. The mouth is circular, sub-terminal and inverted. In a front or back view, the shell of ordinary specimens is more or less ovoid, of homogeneous, chitinoid membrane; but in the larger forms, from sphagnous swamps, the shell is made up of circular plates with beaded borders. The large, handsome varieties I have been unable to procure, the nearest approach being an empty shell, from Sphagnum, with delicate punctations arranged in circles on the shell, Fig. 222. Although not a striking form, yet the glassy shell is beautiful from the elegance of its curves. A nucleus and several contracting vesicles are generally visible. The sarcode, in all my specimens, is colourless, and the pseudopodia, which are never numerous, are protruded in short threads radiating from the mouth. In moving about, the shell is tilted back from the perpendicular, owing to the position of the mouth. No testaceous Rhizopod is more variable in size than Trinema ; I have seen specimens as small as the $\frac{1}{1000}$ of an inch in length, and the sphagnous forms may

Fig. 219.—*Trinema acinus.* Side view.

Fig. 220.—Ditto, somewhat tilted.

Fig. 221.—Front view, showing rounded mouth.

Fig. 222.—Specimen of more robust form of ditto.

Fig. 223.—Side view of empty test.

reach $\frac{1}{250}$ of an inch : but about $\frac{1}{300}$ or $\frac{1}{400}$ of an inch may be considered as average-sized specimens.

Fig. 219. Side view of Trinema, showing oblique mouth, contracting vesicle, pseudopodia extended. From a well among Algæ.

Fig. 220. Another lateral view somewhat tilted. From a well, &c.

Fig. 221. Front view, showing rounded subterminal mouth.

Fig. 222. Front view of a more robust specimen from Sphagnum, showing delicate punctations.

Fig. 223. Side view of empty test, showing the inversion of the mouth.

This article is the concluding one as regards the Rhizopods of the order Protoplasta, sub-orders Lobosa and Filosa. In my next I propose to describe two or three forms belonging to the order Heliozoa, which differ in many material points from those previously described.

J. E. Lord.

Rawtenstall.

NOTES ON AN INSECTIVOROUS PLANT.

ALL the plants of the genus Utricularia are rendered highly interesting on account of their peculiarly-constructed bladders. The greater bladderwort (*Utricularia vulgaris*), one of the commonest, but not the less interesting of the genus is frequently met with in this country, inhabiting ponds, stagnant pools, and foul ditches. It floats near the surface of the water, and is entirely destitute of roots. The leaves are finely dissected into capillary segments, and furnished with small bladders usually measuring about one-fifth of an inch in diameter. The lower, or under side of the bladder is nearly straight, and the outline of the upper part rounded and terminating on the outside with several antenna-like prolongations. Thus the whole bladder in appearance bears a striking resemblance to the "water-flea." The bladder is formed of two layers or cells ; the outer layer consists of large polygonal cells containing water, protoplasm, and chlorophyll, and between these much smaller cells are formed also containing protoplasm. The cells of the inner layer are round, and are also accompanied with smaller cells which support four short pyramidal processes terminating in two large rounded cells—sometimes inclined to be elliptical in outline. The transparent and elastic valve or lid, composed of two minute layers of cells continuous with two layers of larger cells, extends nearly to the opposite side of the bladder, and is then folded under, and rests, or rather presses against the collar or peristome. The surface of the valve is furnished with glands, and on the inner side of the collar numerous small bifid processes are crowded together. Both the valve and the collar proceed into the cavity of the bladder, the entire surface of which is studded with quadrifid processes. Animals gain ingress to the bladder by pressing against the free edge of the valve, which being highly elastic shuts again immediately, and thus prevents their escape. From the peculiar structure of the bladders it may be inferred that they are specially adapted for the capture of minute animals. They have been supposed by some naturalists to be air-bladders by means of which the plant is effectually floated in the water, but having cut off all the bladders from several branches, I found the branches to float as well without them as those with them. I have also found several branches destitute of bladders, and they floated well, the only marked difference being that the plant was decidedly weaker than those possessing them. The amount of organic matter held in solution within the cavities of the bladders is considerable—for they are nearly always found to contain a greater or less number of minute animals, which ultimately become asphyxiated ; disintegration then follows, and absorption begins, for the minute processes—which may be considered analogous to root-hairs—when microscopically examined show their contents to consist of irregularly-shaped masses of matter containing protoplasm. I placed several plants in bell-jars ; some were kept in comparatively pure water—the water being changed at frequent periods—while others were kept in water literally teeming with infusoria ; the plants kept in the latter condition were not only of a darker colour, but of a more vigorous growth, and the quadrifid processes of the bladders when microscopally examined were found to be filled with dense masses of matter containing protoplasm. Plants kept in a purer condition were sickly and much paler in colour, the quadrifid processes being decidedly less dense in their contents.

J. H. A. Hicks, F.R.H.S.

THE DORSAL PORES OF EARTHWORMS.

By the Rev. Hilderic Friend, F.L.S., Author of "Flowers and Flower-Lore," etc.

If a specimen of the common earthworm is examined, especially after having been preserved for a time in spirits, it will be found that a number of pores exist on the back. They are most readily seen on the girdle as a rule, and look exactly like the holes which result from the puncture of a pin or needle. These openings have been known for a considerable time as the dorsal pores, a name which serves not only to define their position, but also to differentiate them from the other openings which exist on various portions of the worm's body—such as the male or spermiducal pores, the nephridiopores, and the puberty pores (*tubercula pubertatis*).

It is now many years since these apertures were first detected. Who first observed them, it is impossible to say. Equally difficult would it be to decide who was the first to notice their presence in describing the animals. In 1727 Dr. Derham, Canon of Windsor, wrote a very interesting work, entitled *Physico-Theology*, in which he endeavours to demonstrate "the being and attributes of God from His works of Creation." He says that under the skin of worms there lies a slimy juice, that they emit as occasion is, at certain perforations between the annuli, to lubricate the body, and facilitate their passage into the earth.' A little later, however, he shows that a certain Dr. Willis had previously written an account of these "Foramina on the top of the back, adjoining to each ring, supplying the place of lungs." Now Willis published his work, *De Anima Brutorum*, in 1672, so that for upwards of two hundred years the pores have been known to science, to go no further back. It is only in recent years, however, that they have been carefully noted, and the position of the first pore recorded for the different species of worm. It has been thought by some that the first dorsal pore was so uniformly placed in the various species of earthworms that a specific character might be based thereon. This, I am disposed to think, is not borne out by facts.

Dr. Benham, one of our few English authorities on the subject, says: "In many earthworms the cœlom is put into communication with the exterior by means of a series of dorsal pores, placed on the intersegmental grooves. In Lumbricus these pores occur in every somite after about segment viii. In Digaster and Perionyx they commence just behind somite iv., in Plutellus behind somite vi. In Pleurochæta and Typhæus the pores are present only behind the clitellum. They are present in Acanthodrilus, and in many Perichætæ." In Allurus they begin behind segment iii. or iv.

As will be inferred from the foregoing, a variety of ideas have prevailed respecting the use to which these apertures were devoted in worm economy. Willis says they supply the place of lungs, and if Derham's remarks apply to the dorsal pores, he regards them simply as the openings through which lubricants were poured. Lloyd Morgan is as cautious on the subject as he is inaccurate. He says: "Every segment of the body, *except the first*, has a dorsal pore opening into the anterior part of the ring in the mid-dorsal line, and two very minute pores, one on each side of the ventral line, which are the external orifices of the nephridia or segmental organs, whose function is excretory." The dorsal pores are not found in the typical earthworm on every segment save the first, and if they are, we are not favoured by the professor with a vestige of an idea as to their use. He says: "There are no specially differentiated respiratory organs, respiration being apparently effected by the surface of the body," so that he does not regard the dorsal pores as lungs.

The most important contribution to the subject is undoubtedly that which was made a few years ago by Hermann Uhde, in a paper which deals chiefly with the structure of the body-wall in earthworms.* He points out that "the dorsal pore lies on the anterior edge of the segment in which it occurs, and appears on the intersegmental groove. It is absent from the foremost segments, but the position of the first pore is constant for a given species. In the common earthworm it occurs between viii. and ix., and in the turgid worm between x. and xi." Claparade formerly described the epidermis as being folded inwards at the dorsal pore, just as it is where the setæ are situated, but Uhde shows that such is not the case. By stripping off the epidermis I have been able to detect the infolding of the cuticle around the setæ, but not around the dorsal pore, which, as Uhde affirms, is a perforation through the epidermis and the muscular layers. The pore appears, according to Vejdovsky and others, to be wanting in fresh-water worms or Limicolæ. In some worms, when the girdle is fully developed, the pores become closed through the growing up of the cuticle around the edge. This is not always the case, however, for the mucous worm has been noted by some to be an exception, while I have found that the dorsal pore on the clitellum or girdle of some species is quite as discernible after the organ has attained full development as before.

* "Zeit. f. Wiss. Zool.," xlvi. pp. 85–142. Benham, "Q. J. Mic. Soc.," Aug. 1886, No. cv., pp. 102–4.

If a worm is opened laterally, and the internal organs removed, so as to leave only the body-wall, it will be possible so to display this portion of the animal as to see the whole series of pores in regular succession. It will be easy then to observe that they are connected with each other by a kind of tube which runs right along the back of the worm. I am a little doubtful whether this is what Uhde refers to when he says that the epithelium of the body-cavity passes across the muscular layers and meets the cuticle around the edge of the pore. The pore has a special set of muscle-bundles which form its sphincter muscle.

Uhde does not think there is the slightest connection between the pores and the nephridia, which are excretory in their function. Yet, in a sense, the dorsal pores play their part in the excretory process, since the fluid contained in the cœlom, or body-cavity, as well as certain other substances which in some species of earthworm are coloured, can be caused to exude through them. Sometimes the exudation is in drops, but some foreign species are able to squirt it to a distance of a foot, much as Peripatus does. In these cases the process is perhaps protective.

It is to Professor Busk that we are indebted, through Professor Lankester, for one of the best accounts of these apertures in English. In a remarkable paper on the earthworm, published by the latter in 1865, we have an illustration of the integument of a worm with all the various pores found on the dorsal surface carefully represented. "One of these orifices, situated in the median dorsal line of the segment, appears always to be larger than the others, and penetrates directly to the perivisceral cavity. That these openings form a very ready and frequent means of escape to the colourless fluid may be ascertained by handling a large earthworm, when some considerable quantity is nearly invariably found to escape from its dorsal surface." Nor is this all. Professor Busk says that the fluid expressed from these pores was of a dirty greyish colour, thin and opaque. Examined under the microscope it contained numerous spherical particles and pyriform granular bodies, besides irregular organic particles.

This coloured fluid differs with the species of worm examined. In some, as the brandling and turgid worm it is yellow; in others, as the mucous worm, it is white; while the red worm yields two kinds of colouring matter.

Notwithstanding the large amount of attention which has been paid to earthworms during the past century, we are even now very badly informed on many points connected with their economy, and there is great need that someone with the necessary leisure, means, and scientific training should investigate some of the details more fully. I have been able to make great progress with my work on the distribution and revision of the British Lumbricidæ—till recently almost totally neglected—and hope by the due publication of the new and interesting results to stimulate further research on the part of others.

Meanwhile, so far as the dorsal pores are concerned, they appear to be for the emission rather than the introduction of fluids, and are apparently lubricative, excretory and protective. Their homology with certain organs found in other Annelids does not seem to have been carefully ascertained—at any rate I know of nothing on the subject in English.

ANIMALS AND MEDICINE.

By Hulwidgeon.

Ungulata.

HORSE.—Among the more peculiar, not to say nasty, subjects of Bate's "Dispensatory," was an article which, as a soil fertilizer, has probably contributed more than any other such to enrich our larders with vegetable, and thereby animal, produce. And, after undergoing the apothecary's fair imitation of nature's disintegrating process, if it really possessed any curative powers, there was little reason why it should not have been as inoffensively serviceable as a drug. Our forefathers evidently accredited it with a profusion of medicinal qualities, and doing so, perhaps were wise to pocket their squeamishness.

Still, few patients nowadays, I imagine, would choose to swallow the two to six ounces, four times a day, prescribed of Bate's *Aqua animalis* (p. 2), a cure for "pleurisies, pains, rheumatisms," and other disorders. Yet such was the allotted dose of that compound of some herbal products, distilled treacle, and horse-dung. Salmon did his best to perpetuate the remedy, such as it was, by recommending it in addition against stone, gravel, and urinary affections. Of this kind too was Bate's *Potio pleuritica* (p. 556), which comprehended two ounces of "juice expressed from horse-dung by mixing with it white wine," and which was "to be taken three or four times a day after blood-letting." But how anybody could stand blood-letting three or four times a day, for any number of days, I am happily not called upon to explain. Concerning this potion Dr. Salmon advises us: "There ought to be six ounces of the white wine, for thereby the juice of the horse-dung will be the better extracted. And it will serve instead of a vehicle to take the medicine in." To an alternative recipe he adds that it "ought also to be stone horse-dung and newly made." This was an "approved" remedy for pleurisy, stitch in the side, colic, gripes, stone, and a variety of other bowel derangements.

In the *Testes equi præparati*, (Bate, p. 638), a stallion was cut to provide the material which, "cut in pieces and washed with white wine, speedily dryed and reduced into powder," furnished a vaunted cure for epilepsy, colic, and abdominal complaints. Salmon also gave the dose, one dram twice daily, in a medium, for convulsions and bowel distempers.

The mare was in no less requisition ; her milk was administered in a diversity of forms. *Caracosmos*, *Cosmos*, *Koumiss* (with variations of spelling), are some of the names given in medicine to the sour curdle, borrowed from the Tartars, which was not first introduced at the Health Exhibition of 1884, but a common medical prescription a dozen or more decades before that date. Mare's milk in its large proportion of lactose, its abundance of serum, and the softness of its almost inseparable butter and cheese (Hooper, pp. 498 *et seq.*), possessed distinctive characters which sometimes rendered it more desirable than other milks. The near approach of its qualities, in general, to those of human milk naturally made it an effectual substitute for the latter, and it was sometimes provided in default of asses' milk.

The horse was one of the animals from which bezoar stones were most commonly procured (*vide* Howard, vol. i. p. 332). Thus, even in death his utility failed us not. Indeed, his carcase rendered us posthumous service worthy of the rhapsodies of the venerable meditator on a broomstick. Its hide when flayed, tanned, dressed, made into shoe-leather, worn out and even decayed, still possessed a benevolent property, for we read (in Howard, vol. ii. p. 970), that "the powder of a burnt old shoe sprinkled on the place," is an effectual healer of galled flesh. Truly, of all the friends of man, this one was faithful to the last !

Perhaps I ought not to omit mention of the *ignis sapientium* (or "heat of horse-dung"), a favourite means of distilling and digesting drugs which was put into frequent practice by the chemists of old. This was accomplished by placing the matter in a closed vessel, inserting it in a manure heap of the requisite proportions, and dubbed in the vulgar tongue a "dung-bath" or "horse's belly," and leaving it for a varying length of time, according to the exigencies of the operation. Salmon, who devotes a great deal of instruction to the practical apothecary, sometimes suggests alternative processes, "for want of the conveniency of horse-dung," but usually first counsels its use. For instances of its application it will suffice to refer the reader to pp. 36, 65, 111, 229, and 572 of Bate.

Horsehair was often of essential service to the physician, as, by insertion, to keep open those artificial ulcers 'yclept *setons* (*vide* Hooper, p. 742). Its osseous system too, no doubt, was answerable for a good many of the "calves-foot jellies," and kindred preparations devoted to the strengthening of the weak.

ASS.—When the Prior de Jonval indited his celebrated panegyric on the value of the ass, he omitted mention of, perhaps, one of its greatest titles to commendation. As if to counterbalance this shortcoming, another familiar classic, Dr. Buchan, is exuberant in his encomiums on this single head ; pinning his canny faith on the nutritious qualities of the milk this creature affords. "Convulsive or nervous asthma," he tells us (p. 370), "is often relieved by the use of asses' milk ;" but his chief recommendation lies in the unstinted praise which he bestowed on it as a sovereign remedy for phthisis, praise which at once elevated it to the front rank of consumption cures, and lent it a reputation which it has not yet lost.

In writing of the treatment of consumption, the doctor tells us (p. 163) : "Asses' milk is commonly reckoned preferable to any other, but it cannot always be obtained. . . . It is hardly to be expected that a gill or two of asses's milk, drank in the space of twenty-four hours, should be able to produce any considerable change in the humours. This medicine however valuable, very seldom performs a cure. The reason is obvious ; it is commonly used too late, is taken in too small quantities, and is not duly persisted in. I have known very extraordinary effects from asses' milk in obstinate coughs, which threatened a consumption, and do verily believe, if used at this period, that it would seldom fail. Asses' milk ought to be drank, if possible, in its natural warmth and, by a grown person, in the quantity ot half an English pint at a time, four times, or at least thrice a day ; a little light bread along with it, so as to make it a kind of meal."

Asinum lac, subsequently wrote Hooper, "is much esteemed in medicine," being "preferred to cow's and other kinds, in phthisical cases, and where the stomach is weak, as containing less oleaginous particles, and being more easily converted into chyle." "Asses' milk has a very strong resemblance to human milk, in colour, smell and consistence. When left at rest for a sufficient time, a cream forms upon its surface, but by no means in such abundance as [on] a woman's milk. Asses' milk differs from cow's milk in its cream being less abundant and more insipid, in its containing less curd, and in its possessing a greater proportion of sugar. The milk of women, mares and asses very nearly agree in their qualities." *Vide* Hooper, pp. 77, 78 and 498—500.

The *Onis*, or asses' dung, which was "in repute" with old Hippocrates, I do not find in any of the last century prescriptions which I have examined. It is perhaps needless to add that the ass was enrolled among the furnishers of bezoar-stones, and that its heels and skeleton were, at least, capable of affording a quantum to our supply of gelatine.

RHINOCEROS.—There is little doubt that the rhinoceros was the producer of a share of the unicorn's and unspecified ivory, dealt with under the heads of Narwhal and Elephant respectively.* It is observable that this brute is, in Pinkerton's edition of "Marco Polo's Voyages" (chap. xxiii.) described

* SCIENCE-GOSSIP, 1890 vol., pp. 153, 154.

as the unicorn, and the name has more or less clung to it ever since. "Our Topsel" (as Izaac Walton calls him), writing in the sixteenth century, remarks that "all the later physicians attribute the virtue of the unicorn's horne to the rhinoceros's horne, but they are deceived by imitation of Isidorus and Albertus, for there is none of the ancient Græcians that have ever observed any medicine in the rhinoceros. The Indians made bottles of their skins wherein they put their lycion, or *succum medicatum*."

Hog.—The most important article derivable from the swine was that adipose matter upon which his world-wide renown is based. *Axungia* or *Adeps suillæ* was the name bestowed upon it in its crude state, by men of medicine, and *Axungia curata* when it had been purified. *Adeps suillæ*, says Hooper (p. 428), with some apparent disregard for the strict rules of orthography and syntax, "forms the base of many unguents, and is often eaten by the poor instead of butter." To cite its manifold uses, even in medicine, would be quite superfluous. It occurs in nearly every ointment, both for cleansing and healing sores, and for eruptions, ulcers, burns, excoriations, inflammations and ocular complaints. Bate and Salmon also prescribe "hog's grease," in combination with other potent agents, for a multitude of skin diseases, and for gout and nodes, "whitloes and felons." For fuller details, *vide* Buchan, App. pp. 35 *et seq.*; Bate, pp. 290–3, 402–3, 699, 703, 705, etc.

But piggy was not alone prolific in lard. Just as in trade he provisions us with so many more varieties of meat than his rivals, so in the laboratory he maintained his advantage by the diversity of the drugs he contributed. Salmon (p. 2), in discussing Bate's *Aqua antiphthisica*, which required an admixture of calf's blood, tells us of other bloods that "may equally serve in the same case; but I have found by experience that hog's blood exceeds them all." Another consumption cure is provided by Salmon (p. 581), with six grains of the "Volatile salt of hog's blood."

Salmon again (p. 247), nourished the emaciated "almost to a miracle," with ten to twelve grains of "volatile salt of hog's flesh" and two drams of sugar, in four ounces of his *Tinctura nutritiva*, administered three times a day-fasting! For lung complaints he prescribed (p. 597), half an ounce of "water distilled from hog's flesh" in two ounces of syrup of myrrh. "Against phthisicks," moreover, he ordains (p. 597) two grains of the salt of hog's flesh in a dose of "syrup of pepons, pompions or melons;" and, for consumptive children (p. 596), another two grains in a mixture of snail-syrup, canary wine and milk water.

The afterbirth of a sow (Bate, p. 641), when washed in white wine, dried and pulverised, was a remedy for falling sickness and some complaints incident to women.

Pig's bladder was used to tie mixtures in, to dip them in hot water and dissolve without dispersing them (Bate, p. 48), and also for dressing wounds. According to Hooper (p. 639), Plunket's cancer remedy should be "laid over the sore or cancer upon a piece of pig's bladder cut to the size of the sore and smeared with the yolk of an egg. The plaster must not be stirred until it drops off, of itself, which will be in a week."

Buchan records (p. 416), a curious use for hog's flesh: If deafness proceeds from dryness of the ears, some, instead of oil, put a small slice of fat bacon into each ear, which is said to answer the purpose very well."

Howard (vol ii. p. 970) tells us that "gallings, produced by the wringing of uneasy shoes, are mollified and kept from swelling by the application of the lungs of a swine, warm, to the grieved part," and "for gallings, burns and eruptions of *papulæ*, a most excellent plaister is prepared of one ounce of recent swine's fat" and other articles.

The bezoar of the pig requires particular mention Smollet informs us ("Present State," vol. viii. p. 126) that "The countries that lie behind Malacca abound with . . . . hog-stones, reckoned more efficacious than the bezoar-stones," and of this opinion we find ample confirmation elsewhere. Writes Howard (vol. i. p. 333), the hog-bezoar "is found in the East Indies in the gall-bladder of a boar. In figure and size it resembles a filberd, though more irregular. Its colour is not fixed, but most commonly white with a teint of green; it is smooth and shining, and is valued at ten times its weight in gold. It is said to be the best preservative against poison; a sovereign cure for the mordoxé, a kind of Indian plague; admirable against malignant fevers, small-pox, most diseases of women, but promotes abortion if used indiscreetly. To use it, they infuse it in water or wine, till it has communicated a little bitterness to it. The Indians prefer it to the goat bezoar."

"Boar's tooth" was one of the outlandish sources of "first alcalies." Bate, on p. 635, includes it in an antipleuritic powder.

FISH REARING UNDER FAVOURABLE CIRCUMSTANCES.

UNDER the influence of continuous freshening rains, joined to other favourable conditions, the young Salmonidæ hatched out last winter have prospered exceedingly this year, at the various Fish-Culture establishments; and have achieved dimensions, in some cases, almost unprecedented. Since fish-culture was introduced we have been brought into closer communion with many of the fluvial forms; and we are now able to watch their progress from babyhood to maturity, with the result that we understand more and more of the history of their lives. We can tell at a glance how far they are affected by meteorological and other conditions, and hence it is that we know how the fry have fared during the past nine or ten months—the period representing their age. A visit to an establishment like that of the Midland Counties Fish-Culture Establishment, at Malvern Wells, Worcestershire, is the means of affording more practical information in the space of an hour than we could possibly gather, by dint of much exertion, in open waters during a period occupying, perhaps, several months. Indeed, it is impossible to ascertain the truth of certain ichthyological matters unless investigations be carried on under semi-artificial circumstances, whereby the objects of study are always accessible.

When I last visited the Establishment referred to, in the early part of last summer, the young trout and salmon fry, hatched out during January and February of the present year, were about two inches in length, now they measure six inches. But it must not be thought that all the young fish have achieved similar dimensions to that mentioned. Like all other animals, fish vary greatly in size, and while one yearling trout may be seven inches long there are not a few that attain to only two inches at that period of their existence. It is possible that the difference in the rate of growth is more marked among fish than other animals. However this may be, we cannot but recognise in this diversity the fact that it forms part of the system which Nature provides against over-population of waters. As it is, the smaller fish are preyed upon by the larger; and the fish-culturist knows only too well that unless he steps in at the juncture of affairs, when the fish reared by him are old enough to obey their instincts and fall upon the smaller and weaker of their congeners, he will lose a large proportion of them and thus become defeated in his endeavours to outdo Nature. He, therefore, adopts the course of isolating the larger fish, first sorting them into sizes, and the dire effects of cannibalism are thereby frustrated.

The process of sorting the fish was recently carried out before me and others, by Mr. Burgess, the owner of the Establishment mentioned, and afforded me great interest. All the "nursery" ponds, in which the young fish have been reared during the spring and summer, were subjected to a thorough examination and minute inspection. The plan adopted was to draw the water off from each pond, leaving only sufficient for the fish to inhabit during the investigation. And here, let me say, that each pond is so constructed as to be quite independent of the other, so that the water can be drawn off from any one habitat without interfering with those adjoining it, and without occasioning a cessation of the water-supply. While the water is running away from the pond, and its volume grows less and less, it is interesting to note the behaviour of the fish, which exhibit a certain amount of excitement and much activity, as the water leaves them. Their efforts to go with the stream, which gushes forth from the waste-pipes, are frantic but ineffectual, as are also their subsequent endeavours to hide from view and enshroud themselves in holes and corners in their dread of being launched into our element, which is equally fatal to them as theirs is to us. But Mr. Burgess's arrangements are so made that the fish are never totally deprived of water, and while the operation of sorting them is in progress, they are well provided for and their physical condition carefully watched, so that not a single death ever occurs. As the fish are presented to view when the water partially flows away, we are enabled to inspect them closely, and as we do so, we marvel that in so short a space of time they have grown so rapidly. But on examining the water closely we note the cause of it, inasmuch as it is alive with all kinds of animate food upon which the fish have built themselves up. The operation of sorting over, and the smaller fish having been removed from destruction, the water is re-admitted, to the great satisfaction of the fish remaining in the pond. The other ponds are similarly treated till they have all been overhauled, and their occupants weeded out and accommodated with habitats corresponding with their size. It is doubtless more convenient to maintain them according to age, but it will be seen that, owing to the wide diversity of growth, such a course is incompatible with the principles of fish-culture. It is believed by the uninitiated that all fry are of corresponding size when they emerge from the ova. This is a great error. To begin with, the eggs are of different sizes, and it will be seen on examining the alevins that there is a remarkable difference also in their dimensions. Without doubt food and other conditions of habitat tend to influence their growth, and therefore it does not follow that because an alevin commences its career at a size below the ordinary standard, it remains a dwarf, any more than a full-sized one will develop into a big fish if the conditions necessary to its prosperity are absent. Again, fry may become weak, and therefore less able to seek and obtain food, and in this way be prevented from thriving; or they may suffer from a paucity of food at the outset of their careers, just when they have absorbed their self-contained sac, and in consequence of this never recover.

Judging by the results produced at fish-cultural establishments, the past spring and summer have been very favourable to fish-rearing; and the satisfactory reports made by fish-breeders as to the health, fine growths and absence of disease among their Salmonidæ confirm this opinion.

ICHTHYOLOGIST.

THE Christmas Lectures to juveniles will this year be on "Life in Motion, or the Animal Machine" (experimentally illustrated), and will be delivered by Professor John G. McKendrick, M.D., F.R.S., the professor of physiology in the University of Glasgow.

AN INTRODUCTION TO THE STUDY OF BRITISH DIPTERA.

ADDITIONAL NOTE.

THE accompanying twelve diagrams of wings of Diptera, having, unfortunately, been omitted from my recent paper on British Diptera in SCIENCE-GOSSIP, I take the opportunity of correcting two errors in previous diagrams.

In Fig. 147, (*Limnobia*, Mg.,) the cross vein forming the basal side of the discal cell should be continued in a straight line till it meets the next vein (the postical).

Fig. 149 is wrongly named *Rhyphus*. This genus was correctly illustrated before, on page 37 (Fig. 26), and Fig. 149 is a diagram of the wing of *Tipula*, L.

As the diagrams of wings have been scattered through the article without regard to the letter-press relating to the families they represented, it may be as well to give a full list of them in their proper order.

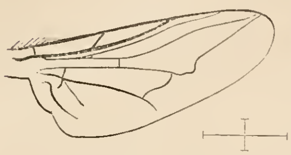

Fig. 224.—*Tachina*, Mg.

Fig. 225.—*Musca*, L

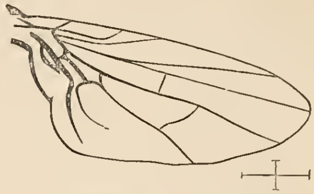

Fig. 226.—*Hyetodesia*, Rond.

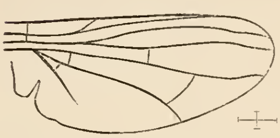

Fig. 227.—*Hydrotæa*, Desv.

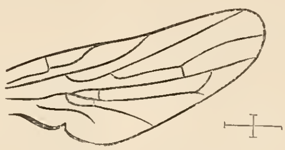

Fig. 228.—*Scatophaga*, Mg.

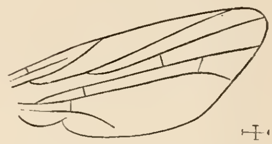

Fig. 229.—*Tephritis*, Latr.

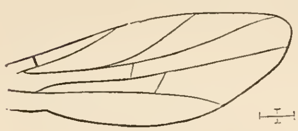

Fig. 230.—*Meromyza*, Mg.

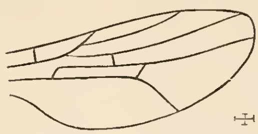

Fig. 231.—*Chlorops*, Mg.

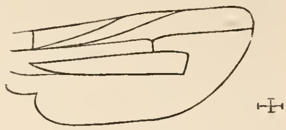

Fig. 232.—*Limosina*, Mcq.

Fig. 233.—*Phytomyza*, Fall.

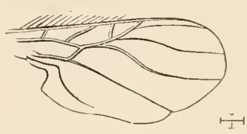

Fig. 234.—*Phora*, Latr.

Fig. 235.—*Hippobosca*, L.

Cecidomyidæ—
Cecidomyia.
Diplosis.
Hormomyia.
Mycetophilidæ—
Sciara.
Mycetophila.
Glaphyroptera.
Bibionidæ—
Scatopse.
Bibio.
Simuliidæ—
Simulium.
Chironomidæ—
Chironomus.
Tanypus.
Psychodidæ—
Psychoda.
Pericoma.
Culicidæ—
Culex.
Dixidæ—
Dixa.
Tipulidæ—
Ptychoptera.
Limnobia.
Tipula.
Rhyphidæ—
Rhyphus.
Stratiomyidæ—
Stratiomyia.
Xylophagidæ—
Xylophagus.
Tabanidæ—
Tabanus.
Leptidæ—
Leptis.
Asilidæ—
Dioctria.
Asilus.
Bombylidæ—
Anthrax.
Bombylius.
Therevidæ—
Thereva.
Scenopinidæ—
Scenopinus.
Cyrtidæ—
Paracrocera.
Empidæ—
Rhamphomyia.
Empis.
Hilara.
Clinocera.
Tachydromia.
Dolichopidæ—
Dolichopus.
Medeterus.
Hydrophorus.
Lonchopteridæ—
Lonchoptera.
Platypezidæ—
Platypeza.
Pipunculidæ—
Pipunculus.
Syrphidæ—
Chrysogaster.
Syrphus.
Volucella.
Eristalis.
Criorhina.
Xylota.
Chrysotoxum.
Conopidæ—
Conops.
Œstridæ—
Œstrus.
Muscidæ—
Tachina.
Musca.
Hyetodesia.
Hydrotæa.
Scatophaga.
Tephritis.
Meromyza.
Chlorops.
Phytomyza.
Limosina.
Phoridæ—
Phora.
Hippoboscidæ—
Hippobosca.

I hope during the winter to be able to extend my notes for beginners, and to write a lengthy supplement to my previous article; this supplement consisting principally of analytical tables of genera. I shall also add notes on parasitic Diptera, and the geological antiquity of this order.

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129 *Grosvenor Park, Camberwell, S.E.*

EUROPEAN BUTTERFLIES.

I PAID a visit to the Continent last summer, for the purpose of obtaining some of the rarer species of butterflies for my collection of European Rhopalocera, and though I was not so successful as I had hoped to be, a few notes about my captures may perhaps interest some of your readers.

My first stopping-place was Coblence, where I arrived about the middle of May.

I went there chiefly in the hope of again seeing *Orchis hircina*, a plant which I found there ten or twelve years ago, but which, although I have always since been on the look-out for it, I have never seen elsewhere.

I was, however, entirely unsuccessful in my search for it, although I went over the old ground day after day for a week : it had evidently been extirpated.

The only at all rare orchis which I saw was *militaris*, of which, however, I found no more than two or three plants.

As to butterflies, they were few and far between. Napi, Cardamines and Egeria, with some Brassicæ, comprising nearly all the species I met with.

This was in all probability owing partly to the lateness of the season, and in part to the great abundance of rain that fell whilst I was there.

My next stopping-place was Heidelberg. I went there chiefly in the hope of getting larvæ of Euphorbia. These occur in great abundance on the right bank of the Neckar, just below the town. I was not successful, however, in my searches, as there was not a single caterpillar to be seen up to the 14th of June, when I left for Freiburg (in Baden), though in some seasons I have found them more than half-grown on that date, and I once had plenty of pupæ by the first week in July, and the imago out by the middle of that month. Cratægi was just coming when I was leaving. Galatea, generally abundant—as it is almost everywhere—was, however, nowhere to be seen, nor were Podalirius, Ilia, Pruni, Sibylla, Virgauriæ or *Arion*, though in ordinary seasons I should have found all of them more or less plentiful. My captures comprised Machaon (very fine), Aurinia (taken on first emerging, and therefore perfect). Hyale apparently just out of the chrysalis—I cannot help thinking these must have hybernated as pupæ—and a very fine lot of Paniscus, an insect that was to be seen almost everywhere in the woods. In addition to the above, I got three very fine specimens of the pretty Arcania, one or two Cinxia, and a single Athalia ; this last was just emerging as I was leaving. It follows Aurinia and Euphrosyne on a rough, damp meadow lying quite in the forest behind Ziegelhausen.

By the way, curiously enough, there are in this meadow quite a number of plants of that almost typical Alpine plant *Arnica montana*. Aurinia and Athalia—and indeed Euphrosyne too—occur here in great profusion when they are in season. They are followed by Aglacia, which is more abundant at this spot than any other place that I know of. Paphia, too, occurs, but more sparingly, and is more confined to the forest paths.

The larvæ of Rhamni was plentiful everywhere. I took a few, from which I obtained some fine specimens for my cabinet. The beautiful moth Tau was plentiful in the woods, and dashed about in its apparently reckless flight in all directions.

I went to Freiburg, in the expectation of getting Rutilus—the continental form of the extinct Dispar—at New Breisach (about twelve miles distant), where, according to Kane, it is abundant at the proper seasons, which are nominally early in June and August ; but in June I totally failed in my object, owing, I have no doubt, to the lateness of the season. In September, however, I managed to catch about two dozen of this pretty little insect, and in fact I found three caterpillars feeding on the great water-dock (*R. hydrolapathum*)—the food-plant of Dispar ; these pupated safely ; but to my great regret the box which contained them was thrown down by accident, and two in consequence came out crippled, the third, however, was a very perfect male. Rutilus is at its best a sorry representative of the type, the extinction of which is a fact ever to be lamented by English Lepidopterists. Dispar was a far finer insect both as to size and depth of colour than any other European Polyommatus with which I am acquainted.

When at Freiburg in June, I found Echine in profusion in a grassy road alongside a damp wood, a mile or two west of the town. They were generally settled on the ground in large flocks of from fifty to a hundred ; they flew up on being approached, but soon alighted again and in companies as before. They were in the finest possible condition, and I got a good series of perfect specimens.

Galatea and Cratægi were also plentiful, as were also many other commoner species. I got one good example of Argiades, the only specimen of that insect I ever saw alive, and one Dictynna.

In September I got a few Prorsa, and a good series of the female of Dorilis, one being a nice variety. I also saw at New Breisach a few Daplidice, and a good many Comma ; Machaon, too, was fairly plentiful, and I secured one shattered specimen of Circe, and saw a second, which escaped my net by flying across a river that I could not ford. Circe is a very fine and striking-looking insect, some specimens are as much as three inches and a quarter in expanse of wing. The contrast of the pure white band on the black ground-colour of the wings, renders it a very conspicuous object when flying.

At the end of the third week in June, I moved on to Neuchatel, in the woods above which place I hoped to find Ilia. In this I was altogether unsuccessful, as I did not see a single specimen of that butterfly.

I was evidently too soon for it in such a backward season. I, however, obtained a fine series of Semiargus and of Lycaon, and a few Hippothoë—these in a meadow at Chaumont, about 2,400 feet above Neuchatel—a few Apollos, two or three Athalias and Cinxias, and a Carthemi or two. I saw numbers of Machaon and of Galatea, Hyale, and Cratægi, as well as many other common species.

The woods above the town were full of the finest spikes of the orchis *H. bifolia* I ever had the good fortune to see, and I found nine plants of *C. grandiflora* in the same woods, the average number of flowers on a spike being, in this case, six (*vide* SCIENCE-GOSSIP 1890, p. 92).

I must not omit to mention that when at Neuchatel, I made an excursion by steamer to the picturesque town of Morat, and that when the boat was passing through the river which unites the two lakes, a beautiful example of the Squacco heron, *E. ralloides*, flew up out of some reeds in a marshy meadow close by, and as it flew in a sort of half-circle round the boat at a distance of about seventy or eighty yards, it afforded me a fine opportunity of making a leisurely inspection of its beauty.

On the whole I had been unfortunate up to this time, as I had not obtained at any of the places named what I had gone there for. Better luck, however, awaited me at Zermatt and Berisal, but I must postpone the particulars of my captures at those places to another occasion, if you, Mr. Editor, will give me space in a future number of your paper for some further notes.

R. B. P.

Eastbourne.

THE RECORD IN ZONITES.

IT was indeed a lovely hot afternoon last summer in that little Kentish village where I had drifted during a conchological walking-tour. Giving myself and the snails a rest, I strolled into the cool old flint church, with twelve other people. I wandered into an old square pew, shut the door and settled down in one corner. In its appointed place the sermon began. I am sorry I cannot say what the subject of the discourse was, for a very large hornet would inspect me all over, humming so loud that I heard not the words of the preacher, and finally it settled on my knee. Quickly I was reaching for a large bible in the corner, wherewith to slay it, when a voice at my elbow said in an undertone, "Do you want any very large Zonites?"

Somehow I was not surprised at the presence of a stranger in the closed pew, or his knowing that I certainly did covet very large Zonites.

"How large?" I inquired mechanically.

"Oh, I will show you some as big as any silver coin you have, provided, of course, I keep the coin.

I quietly produced a shilling.

"Pooooh!" He seemed to swell with contempt.

I hastily produced a florin.

"That's better," replied he, with apparently diminishing bulk; "that will do for Cellarius, but if it comes to Glaber, I ask gold!"

My eagerness and rashness expanded. I whispered loudly, "I will give you a new £5 piece, if you will cover it with a Glaber of equal size."

Now this was wrong of me, I know, for I had not got such a thing, but somehow it seemed all right then. He quietly rose, and we guiltily glided down the aisle, out of the door (my hand clutching his arm), till he paused under the old yew-tree.

"Under this stone," said he; and I at once knelt down and began to struggle with an old mossy head-stone which had apparently lain a century undisturbed.

But before I could effect my purpose, he put his foot on it, as if by accident, saying:

"You will, doubtless, be interested to hear that I have just published a list of names for the band varieties of *H. pisana*."

"Indeed!" said I, "that seems a great many. Why, the various combinations of seventeen bands and their omissions and coalitions must amount to several millions!"

He (impatiently), "Yes, of course it does,"

I (astonished and fumbling at the stone), "Where did you get the names from?"

He (airily), "Oh, I named them after my conchological friends and correspondents. There's Jonesii and Brownii and—"

"I am almost afraid," interrupted I, "that we shall hardly get to the end of the list of your rather numerous friends before they come out of church."

"And," continued he complacently, "I am about to publish a new list of the six hundred true species of British Pisidia with their numerous varieties."

"But," protested I, "Jeffreys says—"

He (loftily), "I never heard of him."

I (pityingly), "Well, it is time you did. He wrote—"

He (more loftily still), "I never read what people write."

I (angrily), "Go and read Jeffreys before you presume—"

He (angrily, and showing signs of inflation), "Jeffreys be—"

I (wrathfully), "Sir! I'll thank you to speak respectfully of the learned Dr.!"

He (with rapidly increasing bulk), "I say Jeffreys be—"

He never finished the sentence, with a mighty tug I wrenched up the ponderous stone and smote him with it Eugene-Aram fashion. He fell beneath it, collapsing like a catcall bladder and giving out much the same sound as that instrument. I had killed him. "Never mind the windbag," thought I, "have I broken any of the Zonites?"

I stooped down and looked. There they were; large as the Algirus, but smooth and glistening! Cellarius, Glaber, and, oh joy! a pale green Radiatulus as large as a florin, with the regular close-set striæ resplendent! A box—of course I had come without one on Sunday! Happy thought, my pouch! I emptied the tobacco hurriedly over the collapsed corpse and reached eagerly for the prey. Hark! a rustling! They must be coming out of church; "And now—"

Dear friends, if that sermon had only lasted two seconds longer I should have broken the record in British Zonites.

L. E. ADAMS.

SCIENCE-GOSSIP.

AT the Entomological Society of London on the 4th November, Dr. D. Sharp, F.R.S., Vice-President in the chair, Mr. Frederick Enock gave a most interesting account of the life-history of *Atypus piceus*—the British representative of the Trap-door Spiders—though it does not make a true trap-door nest, but excavates a hole into the sand, lining it with silk, the aerial portion of a mature nest protruding above ground about two to three inches. This purse-like nest is the work of years, the newly-emerged baby spiderling making a tiny tube one sixteenth of an inch in diameter and one inch long—increasing it in drain and length as it increases in size, until it sometimes reaches fifteen inches in length.

The anatomy of the creature was carefully and fully described, the purpose of the vertical movement of the huge jaws and fangs being clearly shown, and the extraordinary ingenuity displayed in obtaining its food: for no sooner does a fly alight on the outside than the fact is communicated to the spider at the bottom by setting the vertical lines or threads in motion, the spider stealthily ascends until exactly underneath the fly, when with lightning-like rapidity it drives its long fangs through the sand-covered tube and into the fly, which it quickly drags right through and down to the bottom of its nest, where it quietly sucks it dry, ascending again in a few minutes to repair and cover in the rent. The interesting courtship of the male was explained, and the domestic economy, finishing up with the tragedy of the female killing her partner, sucking him dry, and then throwing his dried-up skin out of the nest.

Every detail in the life-history of this spider was most elaborately illustrated by a very large number of exquisite photographs made by Mr. Enock from his original drawings. The effect when shown by the oxy-hydrogen lantern was most striking, many of the movements of the spider being shown in a most realistic manner.

WE are pleased to draw the attention of our readers to Messrs. Dulau and Co's new Catalogue of Zoological and Palæontological Works.

THE second largest electric lighting installation in Liverpool has been put in Messrs. Henechsberg and Ellis's, University House, Islington, by Messrs A. Hall & Co. of that city. The shop is lighted by 140 glow lamps; the windows are fitted with electroliers, and the turret is surmounted by a twenty-ampere arc lamp, which is visible from the Welsh mountains, and will form a beacon-light for shipping entering the Mersey.

AN amusing controversy has been taking place in the *Manchester City News*, respecting the alleged virtue of "Halvivi," as a specific against sea-sickness.

FROM various parts of Great Britain, we have received notes of the unusual lateness of the swallows in leaving us this year. Sometimes these swallows are martins!

ON November 30th, in the large hall of the Athenæum, Bury St. Edmunds, under the presidency of Earl Cadogan, K.G., Dr. J. E. Taylor, editor of SCIENCE GOSSIP, gave an illustrated lecture to a large audience "On the Probability of finding Coal in East Anglia." It is at Culford, on Earl Cadogan's estate, near Bury, that the supposed primary rocks have been struck at the comparatively small depth of 640 feet.

WE confess to a weakness for second-hand book catalogues and for old books generally. Messrs. Pickering and Chatto's last "Book Lover's Leaflet" is one of the most delightful and novel of the series they have yet issued.

FOR ordinary nervous toothache, which is caused by the nervous system being out of order or by excessive fatigue, a very hot bath will so soothe the nerves that sleep will naturally follow, and upon getting up, the patient will feel very much refreshed, and the toothache will be a thing of the past. For what is known as "jumping toothache," hot, dry flannel applied to the face and neck is very effective. For common toothache which is caused by indigestion, or by strong, sweet acid, or anything very hot or cold in a decayed tooth, a little piece of cotton steeped in strong camphor, or oil of cloves, is the best remedy.

MICROSCOPY.

NEW SLIDES.—We have received from Mr. Ernest Hinton, 12 Vosley Road, Upper Holloway, two exceedingly beautiful and interesting preparations: the young or larval form of the pretty sea-horse

(*Hippocampus brevirostris*), best viewed with paraboloid; the other is a slide of one of the larva hydrozoa (*Pennaria carolina*), with tentacles fully extended; also a paraboloid object exquisitely lovely, and in Mr. Hinton's best style of mounting.

ZOOLOGY.

Black-Veined White Butterfly.—It is curious how scarce this butterfly seems to have become of late years. In Newman's "British Butterflies" it is described as being then (1869) common in Monmouthshire, and "in profusion at Strood," and twenty-five other localities are given, in only three of which it is noted as being "rare" or "scarce," while in one it is said to have been "most abundant in 1858." I should be glad if any reader of Science-Gossip, who has captured or seen it within the last twenty years, would give some information about it. I am aware it was taken at Ramsgate three years ago, and Mr. Harcourt-Bath mentions in the "Garner" that a specimen was taken in Shropshire last June, but it has been noticeably absent from "capture" lists for years past, and seemed to have quite disappeared from the British insect fauna.—*Albert H. Waters, Cambridge.*

Monstrosity of Clausilia rugosa. — The occurrence of a shell with two independent apertures, as figured and described by H. Downes, on p. 257, is rather rare. Still several similar cases are recorded in the conchological literature of the last fifty years, some of which are given by Moquin-Tandon in his "Moll. de France," vol. i., p. 323. It may be interesting to collectors unacquainted with this work, and useful to those who in future years hunt up the curiosities of the past, to have the details brought together here in connection with the example figured last month. The French author states that Hartmann had observed this anomaly in *Clausilia plicata* and *C. saxatilis*, Dugès in *C. laminata*, Sarrat in *C. bidens* (Linn.), and Partiot in *C. solida.* To these he adds, from his own observation, *C. rolphii* and *C. nigricans*, and gives a figure of the last-named (pl. xxiv. p. 19). Again, early in the present year T. D. A. Cockerell exhibited at a meeting of the Zool. Soc. (see Reports of meeting held Feb. 17), an example of *C. rugosa* (=*nigricans*) in a similar condition. Then among Pupæ Moquin-Tandon mentions *P. cylindrica* as communicated to him by Michel and *P. polyodon* as seen by himself in a museum. The questions arise, why is this anomaly confined (as it appears to be) to these two genera? what is its cause? and how does the animal effect the perforation of its shell to construct its "back-door"? All the species above mentioned have the aperture of the shell more or less constricted or armed with plaits, folds, or teeth, which, while serving their purpose of barring the entrance against living foes, are liable to become blocked with grit or other matter, lodged too tightly for the animal's power of clearance. The Clausiliæ, moreover, are liable to have the elastic hinge of their little clausium disarranged, or the flap itself dislocated, from similar causes. The prisoner is then bound to break through elsewhere, or perish. The author further states that he had in his cabinet two Clausiliæ with double aperture, showing obstructions *in situ;* in one case (bidens) the old aperture had a fragment of stalk wedged between two folds, in the other case (laminata) the clausium was fixed fast by a grain of quartz. Judging by the absence of records, shells with large and simple mouths are not liable to such an accident. As to the means employed to make a new outlet, there can be little doubt that the jaw is the instrument. If space allowed, evidence might be adduced. Will H. D. kindly complete his record by mentioning locality.—*C. Ashford, Christchurch.*

BOTANY.

Cordyline or Dracæna indivisa.—I do not know whether English horticulturists grow many New Zealand trees or shrubs. There is one of the Dracæna family in this country that certainly deserves to be well-known; it is called by the Maories Toc, is most striking in appearance and delightfully oriental in effect, is very hardy, and, like many others of the family, will easily transplant when small. I will try to describe one I lately saw at the Maori pah or village that rejoices in the name of Koroniti, the nearest the Maori tongue can get to Corinth. The stem of the tree was about seven feet high and about ten inches in diameter all the length. When the broad and beautifully bordered leaves spread gracefully out and upward, the outer leaves being some eight inches across, and three to four feet long, and not so sharp-pointed as the leaves of the Yucca, the broad bronze margin varying to over half inch in width,—makes the tree one to be remembered. Its botanical name is *Cordyline indivisa.* Koroniti is a good-sized pah, situated between forty and fifty miles up the Wanganui river; it is neatly laid out, and where the spaces between the rows of whares or huts cross at right angles there are large walnut-trees that were full of fruit when I was there. These trees were planted by the Missionaries many years ago, when the natives were not too proud to eat a man if he was in good condition, and had no friends who might demand payment. I was much struck with the neatness of the pah; every fallen leaf was carefully swept up every day, and the little patches of tobacco growing round each whare, with their large green leaves and pink flowers gave the whole a cheerful and bright appearance, quite in keeping with the merry laughter of numbers of Maori boys and girls. At this place there lives a man named Hori Pukeika, versed in all the various kinds of tattooing and carving, and his skill with the knife and graver is both wonderful and profitable. However, I have got away from my starting-point, which was to draw attention to the beauties of the beautiful *C. indivisa;* and hope, if it has not already, it will soon find a place in the grounds and gardens about English homes; its appearance is tropical, its form beautiful, with the curious fact of its leaves being quite elastic.—*I. W. B., Wanganui.*

BRAUNTON BURROWS.—I was very much interested in reading Mr. Collins' account of his trip to Braunton Burrows, described in SCIENCE-GOSSIP for October. I have paid several visits to this "Sandy Paradise of botanists," and can strongly recommend it to the notice of collectors. Braunton is only a few miles by rail from either Barnstaple or Ilfracombe, and the Burrows begin about a mile from the station, but are best approached through Mellilot Lane, so called from the abundance of *Melilotus officinalis* growing there. I have, at one time or another, found all the plants mentioned by Mr. Collins on the Burrows, excepting *Iris fœtidissima*, which I have overlooked. Last August *Scirpus holoschœnus* was growing in great abundance near the lighthouse, and was quite easily to be distinguished from its relative, *Juncus acutus*, also growing freely in that locality. Among other rare plants not mentioned by Mr. Collins, I have found growing on Braunton Burrows the following:—*Œnothera biennis*, *Silybum marianum*, *Teucrium scordium* (this grows freely in many of the little boggy valleys which are bounded by sand-hills; *Hypochœris glabra*, growing scantily near the lighthouse. This by no means exhausts the rarities of the Burrows, as many other plants, more or less uncommon, grow there, *e.g. Artemisia maritima*, *Scirpus fluitans*, *Asperugo procumbens*, and *Erigeron acris.* On a fine summer day, a botanist must indeed be in sore straits, if he fail to be happy on Braunton Burrows.—*F. H. Weekes, York.*

GEOLOGY.

REMARKABLE FOSSILS.—There will soon start for Washington a procession of monsters more marvellous than even the mind of a Barnum could have conceived. In this wonderful parade will be gigantic reptiles as big as good-sized houses, some of them one hundred feet in length, flying dragons with twenty-five feet spread of wing, huge birds with teeth, mammals three times the size of elephants, sharks as large as the hugest whales, and countless specimens more of equal strangeness. For nine years past the United States Government has been quarrying for the skeletons of these strange creatures, and now the vast collection, stored at New Haven, is being prepared for delivery to the National Museum at Washington, which building, however, is not large enough to hold more than half of it, so that the rest will follow when Congress has decided upon its accommodation. The business of digging for these enormous fossils is very much like other mining operations. In various parts of the west there are great deposits of them, into which scientific enthusiasts delve as eagerly as in other parts other enthusiasts delve for gold. One of the chosen hunting-grounds is the region between the Rockies and the Wasatch mountains. Ages ago the upheaval of these hills by geologic action cut off the portion of what had been sea between these ranges from the ocean, and the water thus shut away formed large lakes. One of these existed at Wyoming, and the mighty antediluvian mammals gathered in herds around it, to feed on the succulent vegetation of what was then a tropical land. They lived there and died natural deaths, or got mired in the mud when they went to drink, and the sediment deposited in the water covered up their bones and preserved them from decay. By and by the sediment reached a mile in thickness, holding between its layers these ancient skeletons, distributed like currants in a cake. Then the water, draining off, left the land dry, and then subsequent floods washed away parts of the sediment, leaving picturesque cliffs, peaks, and columns, among which the scientific explorer wanders with a keen eye for a bit of bone projecting from the face of a cliff, exposed by the action of water trickling down the hill-side; and when he has found it, a party of men is at once set to work with drill, blast, and pickaxe. Sometimes the find may result in a great deposit of prehistoric monsters being struck. When this is the case it is kept dark, for fear of the piracies of rival men of science. Professor O. C. Marsh, who directs the gathering of the Government collection, has such monster mines of his own all over the West, from which he can draw to order complete skeletons of gigantic creatures which would put the dragons and griffins of mediæval story to the blush. They have quarried out of the solid rock in Wyoming the complete skeleton of a reptile, the Brontosaur. It was sixty feet long, stood fifteen high when alive, and weighed twenty tons. Cast in the rock from which it was taken was a mould of one of its eyeballs. The Triceratops was also discovered in the same neighbourhood. The animal had an enormous bony frill six feet across round its neck, which curious development was evidently intended for the attachment of the muscles necessary to hold up the huge head; for the beast, although only thirty feet long, was as massive as an armour-plate, and had a sharp and horny beak, not to mention a horn on his nose and another on his forehead, the latter two and a half feet in length. The Titanosaur abounds in Colorado; so does the Iguanodon, which had a nipping beak like a turtle's, and walked erect, towering to the height of forty to fifty feet, and using its huge tail for a support. Most of these monsters were harmless creatures, with very little brain power.

Many of these vegetarian colossi had not much more notion of self-defence than kicking. The Lælaps was forty feet long, stood twenty-five feet high on its hind-legs, and was built like a kangaroo. It was the most astonishing jumper that ever existed, with teeth for cutting and sharp claws on the front feet, evidently designed for tearing out its adversary's eyes. Hardly less formidable was the Stegosaur, which was sheathed in armour-plates from two to three feet in width, and had as weapon of offence a powerful tail armed near the end on both sides with sharp spikes two feet long. A peculiarity in this animal's anatomy was an enlargement of the spinal cord at the end of the back; this expansion of brain material was ten times as big as the brain in the skull itself, and was intended to supply power for the wagging of that stupendous spiked tail. Equally large and dangerous were the Megalosaur and Dinosaur, with jaws armed with huge sabre-like teeth, who went about on their hind-legs, seeking something to devour.

NOTES AND QUERIES.

"SPORTING" CLOVER.—Specimens of *Trifolium repens* have on several occasions been recorded in which the sepals have developed into trifoliate leaves. This summer I hape found examples of this "sport" both in the Grantchester Meadows, Cambs., and also in South Wales. Possibly the wet summer may be accountable for them.—*G. H. Bryan.*

SONG OF THE PIED WAGTAIL.—As the song of the pied wagtail seems to be so little known, and in the books I have referred to (by Montague, Yarrell, Wood, and Harding) is only noticed in one, viz., that by Col. Montague, I think it may be of interest to mention that so late as October 27 last, at Tunbridge Wells, I heard a pied wagtail singing very prettily and softly from the top of my house. The song I shall describe as a gentle warbling song, something like a weak and soft robin's, and having some resemblance to a subdued lark's. The song was continued, though of course with breaks, for some two or three minutes, and I thought before I saw the bird that it was a wagtail that was singing, as I heard the ordinary short double note. I have only once before heard a wagtail singing, and that was about eight years ago at Southport, and on that occasion the song seemed to me more like the muffled song of a skylark, than the song which I heard last month.—*Borderer.*

SONG OF THE PIED WAGTAIL.—With reference to the note on the song of the pied wagtail in a recent "Field," I may state that on two occasions I have heard the song of this bird, which, as your correspondent states, seems to be little known. In fact, I did not know that it possessed a song at all (except the usual chirrup) until I heard one sing on March 19th, 1887, while perched on one of the topmost twigs of a hedge. I heard another singing on March 21st, 1888, though not so nicely. I have read several Natural Histories by different authors, in which no reference is made to the song of this bird.—*H. G. Ward.* (*North Marston*).

I OBSERVE "Borderer's" remarks upon the song of the pied wagtail. I heard one sing most sweetly near Moulton, some five years since. I well remember the circumstance. I was walking in the parish of Moulton, near Northampton, when a spring storm came on. I took shelter under a fence, the storm passed over, and the sun suddenly shone out. Just as I was about to leave my shelter a pied wagtail came and settled some six or eight yards from me on the bank, exposed to the sun, and at once on alighting commenced singing most sweetly. For the first moment I could hardly believe it was the bird, the song being like that of a robin, but more subdued. I, however, watched it intently, and could distinctly see its throat moving.—*Wm. Tomalin, Northampton.*

A RARE VISITOR.—On Wednesday afternoon last a fine specimen of a seagull was picked up from the ground at Quainton, where it had sunk completely exhausted. Efforts were made to revive the poor bird without success, and it died in a few hours after its capture. What could have brought this rare visitor, which was in good condition, and in fine plumage, so far inland, it is difficult to understand.—"*Bucks Herald*," *Jan. 11th*, 1890.

VAR. OF HELIX VIRGATA.—Whilst spending a few weeks in Guernsey this summer, I came across a spot near Bordeaux Harbour where the albino form of *Helix virgata* with translucent bands occurred plentifully. The translucent banding in every case corresponded to that of the ordinary coloured varieties with which it lived—the habitat being chiefly on wild fennel, which grows there luxuriantly. Next to the type, the commonest form was that known as v. *leucozona*, both of translucent and coloured shells. The former were very conspicuous on the tops of the fennel, shining in the sun. *Helix pisona*, very fine and pale-coloured, occurs simultaneously.—*B. T.*

GIGANTIC PUFF-BALLS.—In your last number there is a notice of a gigantic puff-ball (*Lycoperdon boviata*); but one of far larger dimensions was sent me two years ago from Wortham in Suffolk, about four miles from this town, and it is still in my possession in its dried and "*Bullfiste*" state. When sent it measured just four feet in circumference, and to my surprise I find it has now lost but one inch of that measurement—47 inches. I wish our clodhoppers, who never lose an opportunity of kicking this handsome fungus to pieces knew how excellent, nutritious and safe a food it is. It cannot be mistaken for any poisonous kind.—*T. E. A.*

"ROSE-HIPS."—Replying to the letters written in SCIENCE-GOSSIP for this month (page 260), I tender my thanks to those correspondents who have so kindly furnished me information regarding the rose-hips I wrote about in the September number of this magazine. There seems to be little doubt but that the hips in question are those of *Rosa rugosa*, since Mr. J. W. Fisher, Mr. G. S. S. and Mr. R. Scott all state their belief in this same fact, but since that plant is unknown to me, personally, I should feel most deeply grateful if the latter gentleman would (as he most kindly offered to do) forward me some of the fruits of *R. rugosa* for study and comparison. I must also apologise for having given the position of the hip, in the drawing I sent up of it, incorrectly, but the error arose from the fact that the specimen given me was totally devoid of any peduncle; that I was quite unacquainted with any hip of that kind, and that by no possibility could I obtain clearer, or more satisfactory particulars concerning it than those previously quoted.—*Miss K. E. Styan.*

The Great Green Grasshopper.—I have in my possession a female grasshopper, *Grylla viridissima*, three inches in length, which was caught at Barford on the Ouse, in Bedfordshire on September 18th, 1891. It died on October 4th, having lived for sixteen days in captivity, during which time its food consisted entirely of French beans. Ova began to be deposited on October 3rd, the last egg being laid on the 4th, the day on which the insect died; the total number of eggs it laid was sixty-four. The process of egg-laying as I observed it, is as follows:—The long horny sheath which is a prolongation of the abdomen, and is divided into two parts, forms, when shut, an instrument for piercing a vertical hole in the ground. When this receptacle is deemed of sufficient depth, an egg slides into it down the open sheath. By means of its two hind-legs, the insect then throws earth down until the cavity is filled up, the process being not unlike that of seed-sowing. A longitudinal section of the ova viewed beneath the microscope appeared as a yellowish mass bounded by dark lines and dotted with minute black circles (probably blood corpuscles); enveloping the mass was a white viscous fluid—the albumen. The horny casing of the ova was tough and of great strength, as appears from the two following experiments:—1st, An entire egg being placed in cold water in a test-tube gradually sank, emitting air bubbles; the water was then allowed to boil, and kept at boiling-point for three minutes, during which time the egg underwent no external change. On being cut open, however, at the expiration of that time, the yellow mass was compact and crumbly, like the yoke of a hard-boiled egg; the albumen had become for the most part also set, but the dark lines and black circles were no longer visible. 2nd, The casing on being treated with potassium hydrate, changed from a greenish-brown, to a dark slate-blue colour, and had a tendency to curl up. The size of the eggs are about $\frac{1}{8}$ of an inch long and $\frac{1}{16}$ broad, oblong in shape and blunted at either end. Externally the colour of the case is of a greenish-brown, with a smooth and shiny aspect; internally it is black, smooth, and highly polished.—*D. V. M.*

Crossbills in Bucks.—A flock of crossbills, *Loxia curvirostra*, has lately been observed in the parish of Hughenden. My informant tells me they appeared about six weeks ago, and after an interval of three weeks reappeared in reduced numbers. Several were killed, and a pair were sent to me, and have been preserved.—*Thos. Marshall, High Wycombe,* "*Field,*" *Dec.* 29, 1888.

The Marcle Landslip.—In reply to Mr. James's enquiry in last month's Science-Gossip, I am able to give some information. The occurrence was not an earthquake, but a landslip. and in its fall it buried Marcle Chapel. It is still called the Marcle Wonder; and the straight outline of the Marcle Ridge is sensibly depressed at the spot, when the hill is viewed from a distance. There have occurred other landslips in the same locality, and they are thus described by the Rev. W. S. Symonds, F.G.S., "Proc. Woolhope Nat. Field Club, 1878." "All the Woolhope landslips occur on the line of junction between the harder limestones of the Aymestry rocks and the softer Ludlow shales, while you may observe that the angle at which the beds dip tells of their high inclination from the axis of upheaval."—*E. Armitage, Herefordshire.*

The White Flower Question.—Although neither I nor any other person is in an altogether satisfactory position to fully and adequately discuss the subject, nevertheless I will endeavour, without wishing to pose as an authority, to answer to the best of my ability Mr. Davey's questions *seriatim*, as given at page 211 *ante*. 1. Do the deviations (*i.e.* of colour into albino) occur through a modification of the pigment cells? Certainly not; who said they did? The cell as a mere normal structure has nothing to do with the pigment, although in some cases it may be that the depth of the colour is proportionate to the number of superimposed layers of the cells in the petal, which act like so many layers of pigment; and in other cases the shades of cólour may be somewhat modified by accidents of surface, as in velvety petals, for example. 2. Is there an intensified oxidation of the chromule? I conclude not, rather the reverse, unless the oxidation goes as far as utter dissipation and destruction, but of this latter it would be difficult to satisfy one's self. 3. Is there really an absence in the pigment of certain elements essential to the normal colouring? Just so, most assuredly there is, *i.e.* the organic basis, so to speak, of the colouring-matter has not (because of too early flowering) got as far as the petals, or it has got there in excessively minute quantity, or possibly in some cases it has been washed out by rain or by acid or saline substances present in moist air. The patient reader will understand that in order to do full justice to this subject, a lengthy memoir and a lavish expenditure of ink and paper would be imperatively necessary, to all which the editor might object. To cut the matter short, however, it may be observed that in the course of my researches I have never seen anything very incongruous with the view expressed by various eminent chemists and biologists, that the tannins (or rather their derivatives, I think) are the bases of the pigments and colouring principles of the flowers at all events. Now, I have personally verified what seems the fact, that in utterly and absolutely white flowers (these are very rare) not an iota of tannin, or of its allies or derivatives, can be detected; in very deeply-tinted petals there is plenty of either of these, both altered and unaltered; and in moderately dyed and very delicate petals, such as the harebell, the transmutation is excessive, so that the original principle can hardly be recognised. But enough has been said, let us hope, to more or less justify the foregoing answer to this third query. Now then for number 4. Are these variations the outcome of a progressive or retrogressive development of colouring-matter? Well, all considerations relative to this question may be scouted to the realms of the poetical imagination. In deference, however, to the feelings of certain individuals who may have been enticed or distracted by sundry so-called theories published in some intensely popular tracts, lectures, or treatises, it may be remarked, that white is no more an advance on yellow than windy gas is on solid stuff or mobile fluid; that in many cases, though not in all, pink, purple, lilac, violet, and perhaps blue petals owe their tint to one and the same substance influenced by the reactions of the vegetable juices; that in cases where the yellow pigment of a flower has been fastened on a definite chemical compound, the latter is a distinct advance and improvement (whatever that may mean) on the compound to which some and possibly all of the more decidedly and utterly red colouring-matters can be attributed; and finally, it would appear that in the purest and least adulterated blue flowers (harebell, flax, etc.) the quantity of the dye is relatively small; wherefore, in so far as mere quantity is concerned, these lag behind in respect to "evolutionary development." It need hardly be added, that the reason why yellow flowers rarely sport into white is glaringly apparent to anybody who pursues the study of plant life with even a modicum of scientific instinct.—*P. Q. Keegan.*

THE WHITE FLOWER QUESTION.—I have several times found the heather on the hills in this neighbourhood bearing white blossoms, but more frequently the flowers were only partially white, being tinged and sometimes blotched, with pink or purple. I have also found, with Mr. F. H. Davey, that the white flowers became pink when dried, but quite a different shade from the usual colour. The plants bearing white blossoms have generally been found in positions facing the south-west, but it does not appear likely that saline matter can have been brought by the wind into this district. Two summers ago I found a white poppy with a yellow centre in a cornfield near here, growing amongst others with flowers of the normal colour. Diligent search was made, but the specimen appeared to be a solitary one, as no other poppies bearing white flowers were found.—*Frederick G. Bing.*

A FIGHT WITH A LIZARD.—Mr. Roger Price sends an account of an adventure with a large lizard on the Bailywith farm, in Bechuanaland. He was riding over the farm with its occupant, Mr. George Willmore, when "suddenly one of Mr. Willmore's pointers came upon the large lizard which the Dutch call legovan (iguana). A fierce fight at once began, the lizard smiting the dog again and again with its long tail, with much dexterity and fury. For some time it would seem as if the dog would have to give in; but after a while he rose to the occasion, and fought most pluckily, pressing the legovan so hard that eventually the ugly and furious beast began to run away with all his little speed, the dog following up his advantage. At this stage the lizard got near the horse ridden by Mr. Willmore, which is, happily, a quiet beast. In a twinkling he began to climb up one of the hind-legs of the horse, and, reaching the tail, he scrambled up that. I had already warned Mr. Willmore that the lizard was climbing his horse, but it was not until the furious reptile had got on to the horse's hip, just behind the saddle, that Mr. Willmore began to realize his position, and it did not take him long to get out of the pigskin and on to mother earth, leaving the infuriated reptile master of the situation, so far. Once on the ground, Mr. Willmore set to unhorsing the intruder, which he did by pushing him off with his gun. Then the beast made for Mr. Willmore himself and began climbing up his leg, but being beaten off, the fight between it and the dog was renewed with fierceness. The lizard got hold of the dog's lip, and retained his hold for some time. Nothing daunted, the pointer managed to bring his mouth round so that he had the lizard's head between his teeth, which he clenched with such vigour that the beast let go his hold. As he seemed inclined to make for the horses again, we gave him a wide berth; and calling away the dog, we left the beast to his own devices, there being no reason for killing him He and the dog mauled one another considerably, but neither got any particular harm.

THE COMMON SNAKE.—Several of your correspondents having recorded the fact of the common snake laying eggs in captivity, perhaps they may be interested in the following. In August 1888, having captured near Dover, a common lizard (*Zootoca vivipara*), I kept it for several weeks in a glass-covered box, feeding it with flies, &c., which it was soon tame enough to take from my fingers. One day I observed that the animal was getting awfully fat and lazy, not to be accounted for by the number of flies which constituted its daily meal, which, in fact, were getting somewhat scarce, when one morning to my surprise, instead of a lot of living youngsters I had expected, I found in the cage several—I think over half a dozen, but can't remember exactly now—jelly-like eggs, each containing a tiny lizard, alive certainly but not apparently ready to be born yet. Are they not generally born alive? The lizard, alas! died next day, after a short period of renewed activity, and all the eggs came to nothing.—*Carolus.*

NOTICES TO CORRESPONDENTS.

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

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

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

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

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

TO OUR RECENT EXCHANGERS.—We are willing to be helpful to our genuine naturalists, but we cannot further allow *disguised* Exchanges like those which frequently come to us to appear unless as advertisements.

P. H. G.—All articles inserted in SCIENCE-GOSSIP are sent by writers gratuitously; nevertheless, we have an abundance and much choice. Most of the leading scientific writers of the day have risen to fame through our columns. No other scientific journal has such a circulation, or better means of introducing new men.

A. CLARK.—Kent's splendid work on the Infusoria was published in parts. It amounted to 3*l.* unbound. Messrs. Wesley & Sons, Essex Street, Strand, may have a secondhand copy. Write to them.

T. B.—Get Professor Roscoe's Elementary Book on Chemistry, published by Macmillan & Co., price 2*s.* 6*d.* A good and cheaper work is by Professor Meldola (price 1*s.* 6*d.*), published by Murby & Co.

MISS B. HOPE.—The Rev. O. Cambridge's book on "Dorsetshire Spiders" is an English classic work on the subject. Have you seen the Rev. Dr. McCook's fine two-volumed work, splendidly illustrated, published by subscription by the author, Boston, U.S.A.

EXCHANGES.

WANTED, foreign land and freshwater shells; good fossils given in exchange. Foreign correspondence invited.—A. Tarver, 11 Westbury Road, Croydon, Surrey.

OFFERED, about 400 species of fossils of the tertiary Parisian grounds, well named and in good state of preservation, and in good number. Wanted in exchange, fossils, shells, prehistoric objects, and postage stamps.—Mr. Louis Giraux, 22 Rue Saint Blaise, Paris.

MICRO-SLIDES. Wanted, test objects for high powers, in exchange for selected slides of fossil diatoms.—J. B. Bessell, F.R.M.S., 8 Elmgrove Road, Bristol.

Montacuta bidentata, M. substriata, Cardium echinatum, Astarte sulcata, Psam. ferroensis, Scrob. alba, Corbula gibba, Rissoa striata, R. semistriata, Skenea planorbis, Cæcum glabrum (with spiral early stage), *Scalaria communis, S. turtonæ, Actæon tornatilis, Philine aperta, Paludina contecta* (over 1½ in. high), *Vertigo pygmæa,* &c.; also correctly named unmounted forams offered for good specimens of British land, freshwater, or marine shells not in collection.—G. W. Chaster, M.R.C.S., Southport.

WANTED, a good and extensive collection of fossils from various formations. Offered in exchange, or part exchange, a good collection of minerals contained in twelve cases, fitted with trays, stained and glazed.—Thomas W. Reader, 171 Hemingford Road, London, N.

WANTED, L. C., 8th ed., good specimens of 27 (fruit), 45, 165, 316, 317, 632, 711, 752, 764, 769, 883, 986, 987, 1105, 1106, 1239, 1240, 1260 (in flower), 1265, 1318 (flower and fruit), 1389, 1395, and 1825. Would give in exchange 19, 21, 76*b*, 95, 116, 119, 139, 150, 161, 191*b*, 229, 247*a*, 247*b*, 340, 423, 443, 541*b*, 545, 686, 755*b*, 783, 784, 936*a*, 973, 1061, 1175, 1196, 1287*b*, 1302*d*, 1410, &c. Address—A. E. Lomax, 56 Vauxhall Road, Liverpool.

POLYZOA, mounted, in exchange for others.—Smith, 121 Bewsey Terrace, Warrington.

Trichomanes radicans, living plants; *Gentiana pneumonanthe*, well-dried specimens 1891; polycystinous earth (Barbadoes), diatomaceous earth (Cwm Bychan), foraminiferous sand (Dog's Bay), *Bulimus Stuchburyi* (Solomon Islands), *B. dealbatus* (Central Texas), British shells, Stark's "Mosses," and "Hobkirk's Synopsis," offered in exchange for foreign land shells.—T. Rogers, 27 Oldham Road, Manchester.

OFFERED, British land, freshwater, and marine shells, also a collection of rare British starfish ready for cabinet, in exchange for shells, insects, birds' eggs, or micro-slides not in collection, or entomological apparatus.—W. D. Rae, 9 Claremont Terrace, Alpha Road, Millwall, London, E.

EXCHANGE.—Side-blown clutches, with data, of red-tailed and red-shouldered buzzards, osprey, downy and golden-winged woodpeckers, sooty and noddy terns, laughing gull, pied-billed grebe, blue-winged teal, killdeer, spotted sandpiper, capercaillie, red-legs, mocking-bird, American robin, meadow starling, belted kingfisher, red-eyc flycatcher, purple martin, white-bellied swallow, ring-ouzle, Leache's petrel. Send lists to—Robert Williams, Croase House, Kingsland, R.S.O.

DUPLICATES.—*H. nemoralis, hortensis, arbustorum, Coch. tridens, Bul. obscurus, Claus. laminata, Vert. pygmæa*, &c. Desiderata. land, freshwater, and marine shells, British and foreign.—H. E. Craven, Matlock Bridge.

WANTED, *Helix nemoralis, H. arbustorum, Clausilia biplicata*. Offered, *Tellina balthica, Litt. obtusata, Dentalium entalis*.—W. Jones, jun., 27 Mayton Street, Holloway, London.

WOULD any young gentlemen residing in S.W. district, who would care to combine for mutual and practical scientific study, send name and address to—J. A. Ellis, 1 Pomona Place, Fulham. Students in all branches of natural history would be welcomed.

WANTED, Lindsay's "British Lichens," and "Treasury of Botany." Offered, "Royal Microscopical Journal" for 1887 and 1888.—F. Coles, 53 Brooke Road, Stoke Newington, London.

S. corneum, N. fluviatilis, B. tentacula, B. Leachii, V. piscinalis, V. cristata, P. nitidis, P. spirorbis, P. vortex, P. corneus, P. contortus, P. hypnorum, P. fontinalis, L. glutinosa, L. stagnalis, S. putris, S. elegans, H. arbustorum, H. cantiana, H. virgata, H. ericetorum, P. nautileus, C. rugosa, &c. Wanted, other shells, land, freshwater or marine, British or foreign.—J. W. Boult, 17 Finsbury Grove, Fountain Road, Hull.

VERY rich and clean diatomaceous deposit, Troy, N.H. Wanted, soundings, or other diatom. deposits.—F. Emsley, 98 West Street, Leeds.

Machaon, Cratægi, Paphia, Polychloros, Sylvanus, Hyperanthus, Corydon, Galathea, Ligustri, Caja, Dispar, Chi, Betularia, Vinula, Silago, Lanestris, Jacobæa, Pudibunda. Desiderata, side-blown birds' eggs, one hole.—F. J. Basell, 61 St. James' Road, Northampton.

FOR exchange, British and exotic lepidoptera for others, or offers.—A. H. Shepherd, 81 Corinne Road, London, N.

WANTED, miocene and cretaceous fossils, in exchange for others from Australia.—J. F. Mulder, Moorabool Street, Geelong, Victoria.

WANTED, to correspond with a British ornithologist with a view to exchange skins, eggs, &c.—J. F. Mulder, Moorabool Street, Geelong, Victoria.

OFFERED, good unmounted specimens of *Chelifer Latreillei*, in exchange for slides.—Geo. Parish, 124 Kingston Road, Oxford.

WANTED, botanic micro-slides, and M'Alpine's "Botanic Atlas." Will give unmounted material and mounted sections, &c., in exchange. Address — T. B., Conservative Club, Hinckley.

Stenothyra deltæ, Neritina cornucopiæ, N. perroteti, N. Bengalensis, Plectopylis achetina, P. repercussa, Helicarion Flemingii, Napæus domina, Algaœus sculptilis, Hydrocœna Blanfordiana, offered in exchange for other shells.—Miss Linter, Arragon Close, Twickenham.

WANTED, works by Morris, Seebohm, and Hewitson, also back numbers of the following, either bound or otherwise: SCIENCE-GOSSIP, "The Garner," "Field Club," and the "Zoologist." Will exchange either books or eggs.—W. R. Riley, Savile Lea, Halifax, Yorks.

FOR slide of wing-case of weevil (*Phyllobius argentatus*), with brilliant green scales, in balsam, send slide of interest to —I. Boggust, Alton, Hants.

Avicula hirundo, Isocardia cor, Mangelia striolata, wanted in return for rare British and foreign shells, geological specimens. Mutual exchange.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth.

WANTED, back numbers of SCIENCE-GOSSIP previous to 1890, micro-slides and material, in exchange for well-mounted slides or material. Address—F. S. Morton, 158 Cumberland Street, Portland, Maine, U.S.A.

OFFERED, British and other European phænogams and vascular cryptogams; also North American for those of India, Japan, South America, or any other country. Printed list of duplicates. Medicinal plants particularly desired.—H. Fisher, Stodman Street, Newark, Notts.

OFFERED, nineteen polished pebbles in exchange for Stark's "British Mosses," or Dr. M. C. Cooke's "British Fungi."—H. E. Griset, 4 Downshire Hill, Hampstead, N.W.

THE undersigned will exchange specimens of the rarer British mosses for good, well-preserved, and accurately named flowering plants from the Southern Counties.—J. Cash, Sale, Manchester.

MOSSES.—A large number of British mosses, correctly named, offered; British fossils of the Permian system, or of the lias, Rhætic, or any of the secondary formation, wanted in exchange.—Dr. Fraser, Chapel Ash, Wolverhampton.

Terebratula duplicata, and other fossils from the Cambridge chloritic marl, in exchange for fossils, land and freshwater shells, lepidoptera (especially crambites), or birds' eggs.—A. H. Waters, Priory Road, Cambridge.

WILL forward Devonian corals and sponges, for making sections from for the microscope, in exchange for corals from other formations for cutting up. Also wanted, geological slides, large showy coal ferns, and shells, as *Mangelia striolata, Avicula hirundo, Isocardia cor*, for which I shall be pleased to offer other extremely rare British shells in return, or state desiderata.—A. J. R. Sclater, M.C.S., 23 Bank Street, Teignmouth, South Devon.

CAN offer polished madrepores of Devonian corals, and spongy forms, minerals, fossils, dredgings and drift containing lovely micro. objects, and coral mounts in exchange for rare foreign stamps, and secondhand watch that will keep time, or natural history specimens.—Mr. T. E. Sclater, Bank Street, Teignmouth.

WANTED, parts of insects, parasites, &c., unmounted; will give slides in exchange.—George T. Read, 87 Lordship Road, Stoke Newington, London, N.

I HAVE a large collection of selachian teeth and spines from the C. L. of Bristol, for 10*l.*, 190 in number. Teeth numerous in species, some new or rare, spines few but good. I have also a lot of ichthyos and plesiosaurian remains from Street, that I can sell cheap, as I want the room. A whole ichthyo and two large unmounted fragments of plesios (if not whole), and several other good fragments—heads, vertebral columns, &c., all neatly mounted, and fit for exhibition. Price 25*l.* the lot.—Thos. Stock, 16 Glen Park, Eastville, Bristol.

CAMBRIAN and Silurian trilobites and other fossils, and Wenlock corals given in exchange for fossils from all formations. Lists exchanged.—W. H. Banks, Ridgebourne, Kington, Herefordshire.

BOOKS, ETC., RECEIVED FOR NOTICE.

"Handbook to the Geology of Derbyshire," by the Rev. J. M. Mello (London: Bemrose & Sons).—"The Physical Geology and Geography of Ireland," by Professor Ed. Hull (London: Edward Stanford).—"British Fungi," by George Massee (London: L. Reeve & Co.).—"The Plant World," by G. Massee (London: Whittaker).—"Colour-Blindness," by Dr. F. W. Erdridge-Green (London: Kegan Paul & Co.).—"Geodesy," by J. Howard Gore (London: William Heinemann).—"Moral Teachings of Science," by Arabella B. Buckley (London: Edward Stanford).—"Catalogue of the British Hymenoptera" (published by the Trustees of the British Museum, and by Longmans & Co.).—"British Oligocene and Eocene Mollusca," by R. B. Newton (published by same).—Vols. of Smithsonian Reports for 1887, 1888, and 1889 (Washington: Government Printing Office).—"Trans. of Guernsey Soc. of Nat. Science."—"The Microscope."—"The American Monthly Micro. Journal."—"American Naturalist."—"Canadian Entomologist."—"The Naturalist."—"The Botanical Gazette."—"The Gentleman's Magazine."—"The Midland Naturalist."—"The Essex Naturalist."—"The Garner and Naturalist's Gazette."—"Feuille des Jeunes Naturalistes."—"Journal of Microscopy," &c., &c.

COMMUNICATIONS RECEIVED UP TO THE 12TH ULT. FROM: J. E. T.—R. B. P.—W. D. R.—C. P. G.—T. W. R.—A. G. T.—K. E. S.—T. R.—H. M. B.—J. T.—T. S. K.—J. S.—A. E. L.—J. B. B.—W. R. S.—L. G.—A. W. R.—T. S. I.—T. G. B.—T. A.—G. H. W.—T. S.—R. B. B.—N. C.—F. W. W.—J. D. C.—W. T.—N. S. T.—W. W. R.—J. E.—Miss W.—Dr. R.—J. H.—J. W. M.—O. A. S.—H. E. C.—F. J. B.—R. W.—Dr. P. Q. K.—A. C.—J. W. B.—F. C.—F. E.—J. A. E.—W. R. K.—C. A.—E. A.—T. B.—W. A.—J. F. M.—G. P.—A. H. S.—J. B.—F. E.—H. G.—T. B. G.—F. K.—T. A.—C. W.—A. S. T.—A. H.—E. B.—A. H. W.—A. J. R. S.—T. E. S.—H. C.—J. F.—C. H. G.—T. S.—F. S. M.—B. H.—J. C.—G. I. R.—F. G. B.—H. F.—H. E. G.—H. W. B.—L. E. A.—C. W.—H. B.—P. H. G.—M. A. S.—W. A. C.—&c., &c.

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